# FCC Test Report

Report No.: AGC14501220601FE03

| | | |
|---|---|---|
| **FCC ID** | : | 2AWQF-TINBUDS3 |
| **APPLICATION PURPOSE** | : | Original Equipment |
| **PRODUCT DESIGNATION** | : | Bluetooth Earphone |
| **BRAND NAME** | : | TIN HiFi |
| **MODEL NAME** | : | TINBUDS3 |
| **APPLICANT** | : | Zhongshan Dongting Electronics Technology Co., Ltd |
| **DATE OF ISSUE** | : | Jun. 22, 2022 |
| **STANDARD(S)** | : | FCC Part 15.247 |
| **REPORT VERSION** | : | V1.0 |

Attestation of Global Compliance (Shenzhen) Co., Ltd

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## REPORT REVISE RECORD

| Report Version | Revise Time | Issued Date | Valid Version | Notes |
|---|---|---|---|---|
| V1.0 | / | Jun. 22, 2022 | Valid | Initial Release |

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## 1. VERIFICATION OF CONFORMITY

| | |
|---|---|
| **Applicant** | Zhongshan Dongting Electronics Technology Co., Ltd |
| **Address** | Room 27B, building 2, 383 fuhua road, western district, zhongshan city, China |
| **Manufacturer** | Dongguan Vowsound Electronics Co., Ltd |
| **Address** | 8 Boyan Road, Botou Industrial Zone, Chashan Town, Dongguan City, Guangdong Province, China |
| **Factory** | Dongguan Vowsound Electronics Co., Ltd |
| **Address** | 8 Boyan Road, Botou Industrial Zone, Chashan Town, Dongguan City, Guangdong Province, China |
| **Product Designation** | Bluetooth Earphone |
| **Brand Name** | TIN HiFi |
| **Test Model** | TINBUDS3 |
| **Date of test** | Jun. 13, 2022 to Jun. 22, 2022 |
| **Deviation** | No any deviation from the test method |
| **Condition of Test Sample** | Normal |
| **Test Result** | Pass |
| **Report Template** | AGCRT-US-BR/RF |

We hereby certify that:

The above equipment was tested by Attestation of Global Compliance (Shenzhen) Co., Ltd. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10 (2013) and the energy emitted by the sample EUT tested as described in this report is in compliance with radiated emission limits of FCC PART 15.247.

| | | |
|---|---|---|
| Prepared By | Thea Huang<br>(Project Engineer) | Jun. 22, 2022 |
| Reviewed By | Calvin Liu<br>(Reviewer) | Jun. 22, 2022 |
| Approved By | Max Zhang<br>(Authorized Officer) | Jun. 22, 2022 |

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# 2. GENERAL INFORMATION

## 2.1. PRODUCT DESCRIPTION

The EUT is designed as “Bluetooth Earphone”. It is designed by way of utilizing the GFSK, π /4-DQPSK and 8DPSK technology to achieve the system operation.

A major technical description of EUT is described as following

| | |
|---|---|
| **Operation Frequency** | 2.402 GHz to 2.480 GHz |
| **RF Output Power** | 2.183dBm (Max) |
| **Bluetooth Version** | V5.2 |
| **Modulation** | BR ☒GFSK, EDR ☒π /4-DQPSK, ☒8DPSK<br>BLE ☐GFSK 1Mbps ☐GFSK 2Mbps |
| **Number of channels** | 79 |
| **Hardware Version** | V01 |
| **Software Version** | V5.2 |
| **Antenna Designation** | FPC Antenna (Comply with requirements of the FCC part 15.203) |
| **Antenna Gain** | -5.8dBi |
| **Power Supply** | DC 3.7V by battery or DC 5V by adapter |
| Note: 1. The EUT comprises left and right channel headsets, both are the same, the left headset had been tested and recorded in this report as the worst case.<br>2. The EUT doesn’t support BLE. | |

## 2.2. TABLE OF CARRIER FREQUENCYS

| Frequency Band | Channel Number | Frequency |
|---|---|---|
| 2402~2480MHz | 0 | 2402 MHz |
| | 1 | 2403 MHz |
| | : | : |
| | 38 | 2440 MHz |
| | 39 | 2441 MHz |
| | 40 | 2442 MHz |
| | : | : |
| | 77 | 2479 MHz |
| | 78 | 2480 MHz |

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## 2.3. RECEIVER INPUT BANDWIDTH

The input bandwidth of the receiver is 1.3MHz, in every connection one Bluetooth device is the master and the other one is slave. The master determines the hopping sequence. The slave follows this sequence. Both devices shift between RX and TX time slot according to the clock of the master. Additionally, the type of connection (e.g. single of multi slot packet) is set up at the beginning of the connection. The master adapts its hopping frequency and its TX/RX timing according to the packet type of the connection. Also, the slave of the connection will use these settings. Repeating of a packet has no influence on the hopping sequence. The hopping sequence generated by the master of the connection will be followed in any case. That means, a repeated packet will not be send on the same frequency, it is send on the next frequency of the hopping sequence.

## 2.4. EXAMPLE OF A HOPPING SEQUENCY IN DATA MODE

Example of a hopping sequence in data mode:
40, 21, 44, 23, 04, 15, 66, 56, 19, 78, 07, 28, 69, 55,
36, 45, 05, 13, 43, 74, 57, 35, 67, 76, 02, 34, 54, 63,
42, 11, 30, 06, 64, 25, 75, 48, 17, 33, 58, 01, 29, 14,
51, 72, 03, 31, 50, 61, 77, 18, 10, 47, 12, 68, 08, 49,
20, 00, 73, 09, 16, 60, 71, 41, 24, 53, 38, 26, 46, 37,
65, 32, 70, 52, 27, 59, 22, 62, 39

## 2.5. EQUALLY AVERAGE USE OF FREQUENCIES AND BEHAVIOUR

The generation of the hopping sequence in connection mode depends essentially on two input values:

1. LAP/UAP of the master of the connection.
2. Internal master clock.

The LAP (lower address part) are the 24 LSB's of the 48 BD_ADDRESS. The BD_ADDRESS is an unambiguous number of every Bluetooth unit. The UAP (upper address part) are the 24MSB's of the 48BD_ADDRESS

The internal clock of a Bluetooth unit is derived from a free running clock which is never adjusted and is never turned off. For behavior action with other units only offset is used. It has no relation to the time of the day. Its resolution is at least half the RX/TX slot length of 312.5us. The clock has a cycle of about one day(23h30).

In most case it is implemented as 28 bits counter. For the deriving of the hopping sequence the entire. LAP (24 bits),4LSB's(4bits) (Input 1) and the 27MSB's of the clock (Input 2) are used. With this input values different mathematical procedures (permutations, additions, XOR-operations) are performed to generate the Sequence. This will be done at the beginning of every new transmission.

Regarding short transmissions the Bluetooth system has the following behavior:

The first connection between the two devices is established, a hopping sequence was generated. For Transmitting the wanted data the complete hopping sequence was not used. The connection ended.

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The second connection will be established. A new hopping sequence is generated. Due to the fact the Bluetooth clock has a different value, because the period between the two transmission is longer (and it Cannot be shorter) than the minimum resolution of the clock(312.5us). The hopping sequence will always differ from the first one.

### 2.6. RELATED SUBMITTAL(S) / GRANT (S)

This submittal(s) (test report) is intended for **FCC ID: 2AWQF-TINBUDS3** filing to comply with the FCC PART 15.247 requirements.

### 2.7. TEST METHODOLOGY

Both conducted and radiated testing was performed according to the procedures in ANSI C63.10 (2013). Radiated testing was performed at an antenna to EUT distance 3 meters.

### 2.8. SPECIAL ACCESSORIES

Refer to section 5.2.

### 2.9. EQUIPMENT MODIFICATIONS

Not available for this EUT intended for grant.

### 2.10. ANTENNA REQUIREMENT

This intentional radiator is designed with a permanently attached antenna of an antenna to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

For more information of the antenna, please refer to the APPENDIX B: PHOTOGRAPHS OF EUT.

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## 3. MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement y ±U, where expended uncertainty U is based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95%.

| Item | Measurement Uncertainty |
|---|---|
| Uncertainty of Conducted Emission for AC Port | $U_c$ = ±3.1 dB |
| Uncertainty of Radiated Emission below 1GHz | $U_c$ = ±4.0 dB |
| Uncertainty of Radiated Emission above 1GHz | $U_c$ = ±4.8 dB |
| Uncertainty of total RF power, conducted | $U_c$ = ±0.8 dB |
| Uncertainty of RF power density, conducted | $U_c$ = ±2.6 dB |
| Uncertainty of spurious emissions, conducted | $U_c$ = ±2 % |
| Uncertainty of Occupied Channel Bandwidth | $U_c$ = ±2 % |

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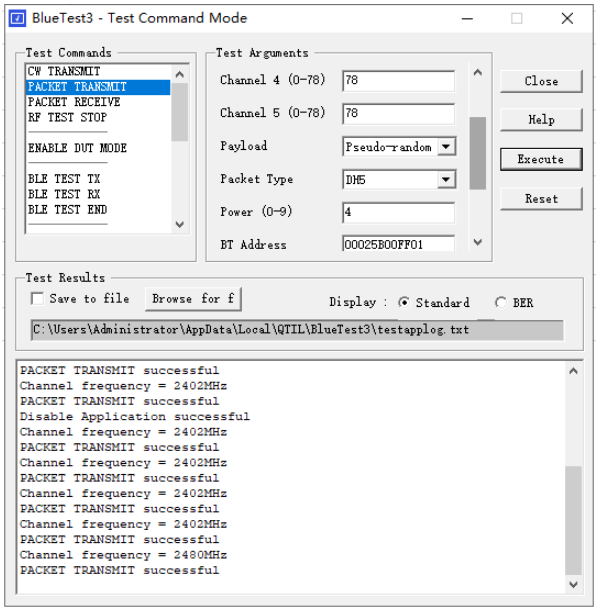
## 4. DESCRIPTION OF TEST MODES

| NO. | TEST MODE DESCRIPTION |
|---|---|
| 1 | Low channel GFSK |
| 2 | Middle channel GFSK |
| 3 | High channel GFSK |
| 4 | Low channel π/4-DQPSK |
| 5 | Middle channel π/4-DQPSK |
| 6 | High channel π/4-DQPSK |
| 7 | Low channel 8DPSK |
| 8 | Middle channel 8DPSK |
| 9 | High channel 8DPSK |
| 10 | Hopping mode GFSK |
| 11 | Hopping mode π/4-DQPSK |
| 12 | Hopping mode 8DPSK |

Note:

1. Only the result of the worst case was recorded in the report, if no other cases.
2. For Radiated Emission, 3axis were chosen for testing for each applicable mode.
3. For Conducted Test method, a temporary antenna connector is provided by the manufacture.

Software Setting

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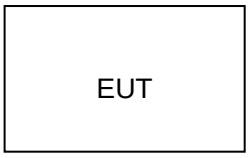
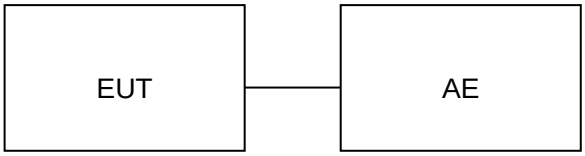
# 5. SYSTEM TEST CONFIGURATION

## 5.1. CONFIGURATION OF EUT SYSTEM

Radiated Emission Configure:




Conducted Emission Configure:




## 5.2. EQUIPMENT USED IN TESTED SYSTEM

| Item | Equipment | Model No. | ID or Specification | Remark |
|---|---|---|---|---|
| 1 | Bluetooth Earphone | TINBUDS3 | 2AWQF-TINBUDS3 | EUT |
| 2 | Control Box | QUALCOMM TRBI200 | N/A | AE |

## 5.3. SUMMARY OF TEST RESULTS

| FCC RULES | DESCRIPTION OF TEST | RESULT |
|---|---|---|
| 15.247 (b)(1) | Peak Output Power | Compliant |
| 15.247 (a)(1) | 20 dB Bandwidth | Compliant |
| 15.247 (d) | Conducted Spurious Emission | Compliant |
| 15.209 | Radiated Emission | Compliant |
| 15.247 (a)(1)(iii) | Number of Hopping Frequency | Compliant |
| 15.247 (a)(1)(iii) | Time of Occupancy | Compliant |
| 15.247 (a)(1) | Frequency Separation | Compliant |
| 15.207 | Conducted Emission | Not applicable |

Note: The BT function cannot transmit when charging.

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## 6. TEST FACILITY

| | |
|---|---|
| **Test Site** | Attestation of Global Compliance (Shenzhen) Co., Ltd |
| **Location** | 1-2/F, Building 19, Junfeng Industrial Park, Chongqing Road, Heping Community, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China |
| **Designation Number** | CN1259 |
| **FCC Test Firm Registration Number** | 975832 |
| **A2LA Cert. No.** | 5054.02 |
| **Description** | Attestation of Global Compliance (Shenzhen) Co., Ltd is accredited by A2LA |

**TEST EQUIPMENT OF RADIATED EMISSION TEST**

| Equipment | Manufacturer | Model | S/N | Cal. Date | Cal. Due |
|---|---|---|---|---|---|
| TEST RECEIVER | R&S | ESCI | 10096 | Mar. 28, 2022 | Mar. 27, 2023 |
| EXA Signal Analyzer | Aglient | N9010A | MY53470504 | Nov. 17, 2021 | Nov. 16, 2022 |
| 2.4GHz Filter | EM Electronics | 2400-2500 | N/A | Mar. 22, 2022 | Mar. 21, 2024 |
| Attenuator | ZHINAN | E-002 | N/A | Sep. 03, 2020 | Sep. 02, 2022 |
| Horn antenna | SCHWARZBECK | BBHA 9170 | #768 | Oct. 31, 2021 | Oct. 30, 2023 |
| Active loop antenna (9K-30MHz) | ZHINAN | ZN30900C | 18051 | Mar. 12, 2022 | Mar. 11, 2024 |
| Double-Ridged Waveguide Horn | ETS LINDGREN | 3117 | 00034609 | Apr. 23, 2021 | Apr. 22, 2023 |
| Broadband Preamplifier | ETS LINDGREN | 3117PA | 00225134 | Sep. 03, 2020 | Sep. 02, 2022 |
| ANTENNA | SCHWARZBECK | VULB9168 | 494 | Jan. 08, 2021 | Jan. 07, 2023 |
| Test software | Tonscend | JS32-RE (Ver.2.5) | N/A | N/A | N/A |

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# 7. PEAK OUTPUT POWER

## 7.1. MEASUREMENT PROCEDURE

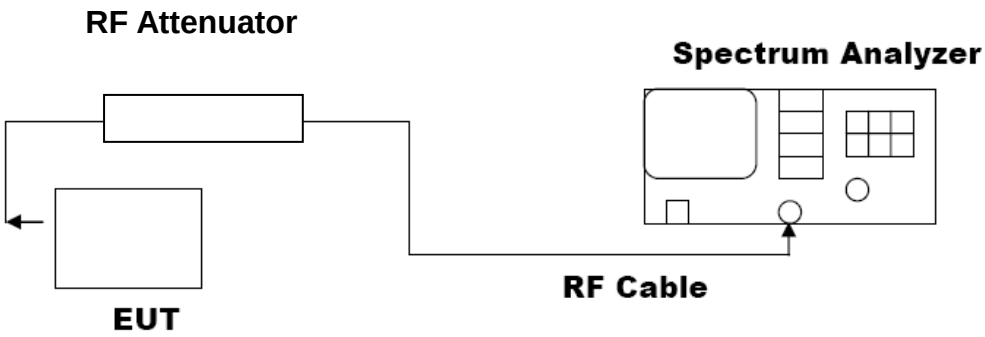
For peak power test:

1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
2. Span: Approximately five times the 20 dB bandwidth, centered on a hopping channel.
3. RBW > 20 dB bandwidth of the emission being measured.
4. VBW ⩾RBW.
5. Sweep: Auto.
6. Detector function: Peak.
7. Trace: Max hold.

Allow trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. The indicated level is the peak output power, after any corrections for external attenuators and cables.

## 7.2. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)

**PEAK POWER TEST SETUP**

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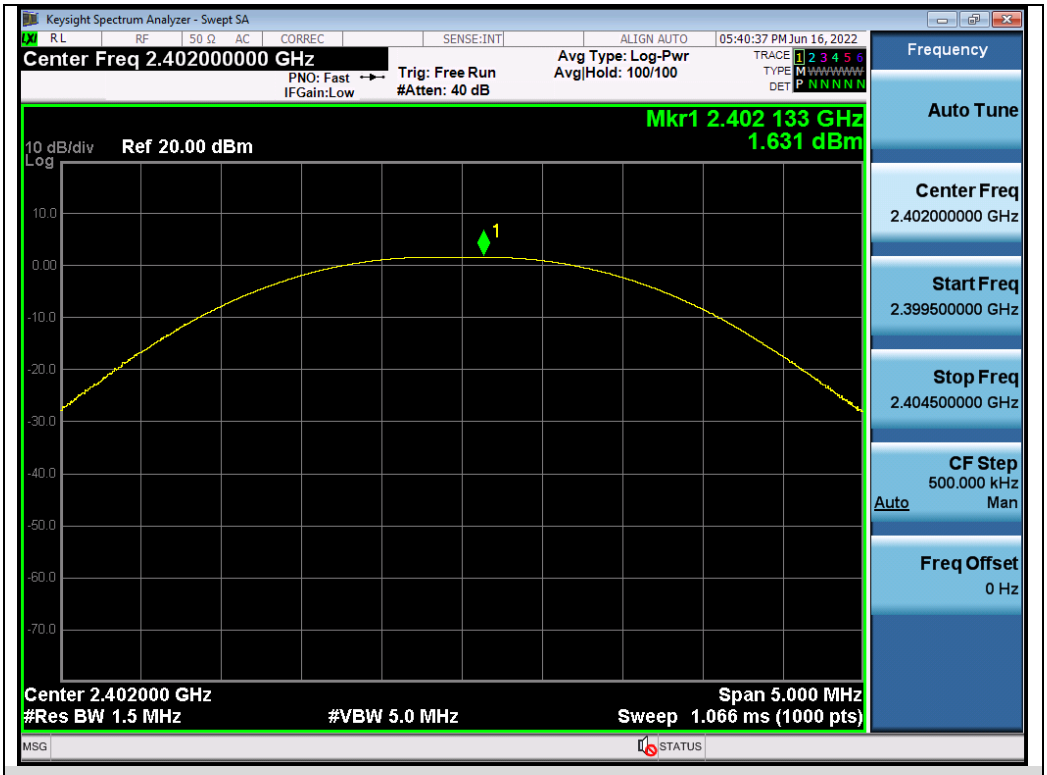
## 7.3. LIMITS AND MEASUREMENT RESULT

| Test Data of Conducted Output Power | | | | |
|---|---|---|---|---|
| Test Mode | Test Channel (MHz) | Peak Power (dBm) | Limits (dBm) | Pass or Fail |
| GFSK | 2402 | 1.631 | ≤21 | Pass |
| | 2441 | 1.792 | ≤21 | Pass |
| | 2480 | 2.183 | ≤21 | Pass |
| π /4-DQPSK | 2402 | -0.356 | ≤21 | Pass |
| | 2441 | -0.172 | ≤21 | Pass |
| | 2480 | 0.191 | ≤21 | Pass |
| 8DPSK | 2402 | 0.164 | ≤21 | Pass |
| | 2441 | 0.331 | ≤21 | Pass |
| | 2480 | 0.696 | ≤21 | Pass |

**Test Graphs of Conducted Output Power**




Test_Graph_BR_ANT1_2402_1Mbps_Peak Power

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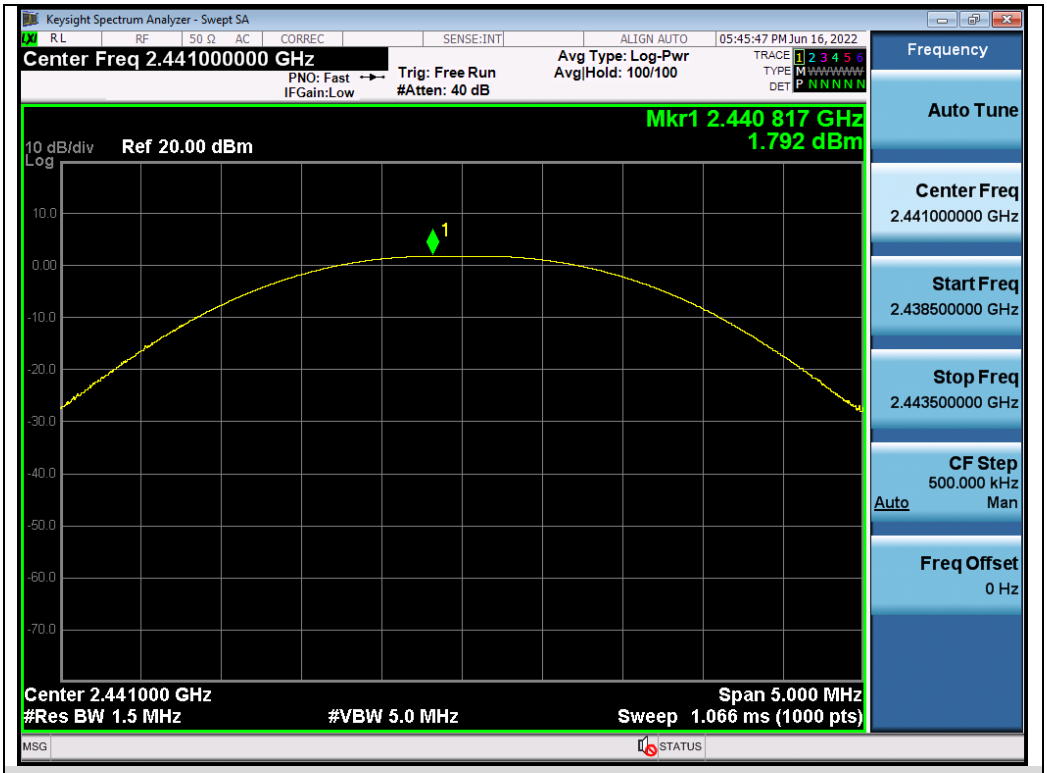
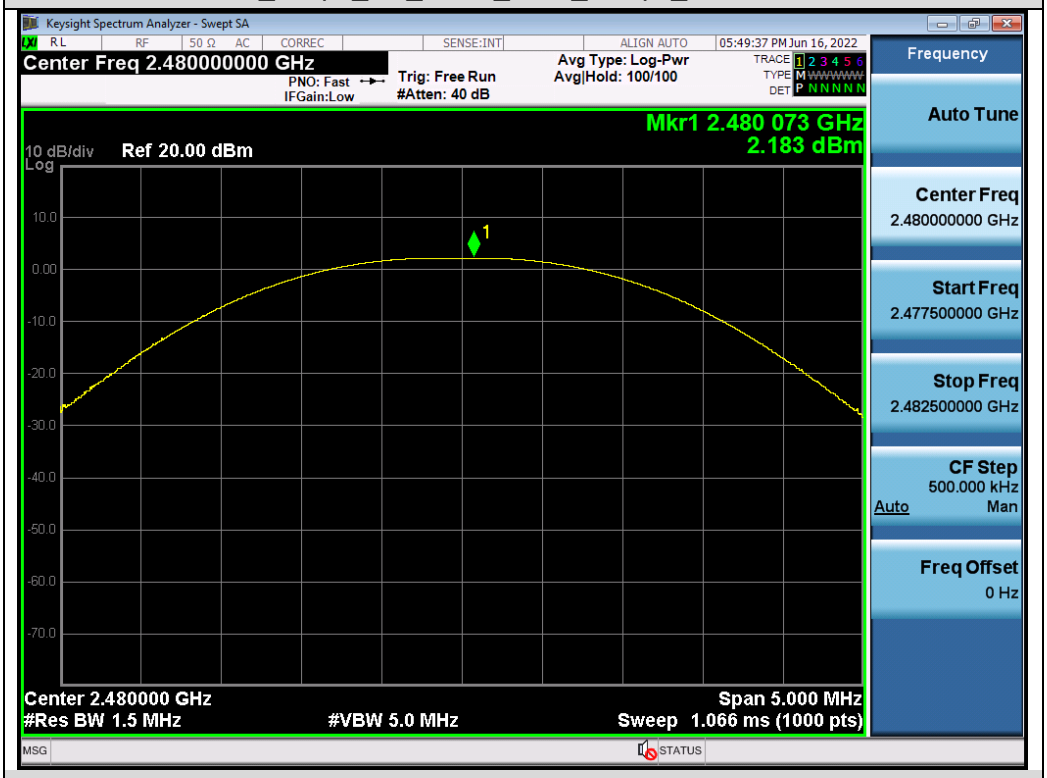



Test_Graph_BR_ANT1_2441_1Mbps_Peak Power




Test_Graph_BR_ANT1_2480_1Mbps_Peak Power

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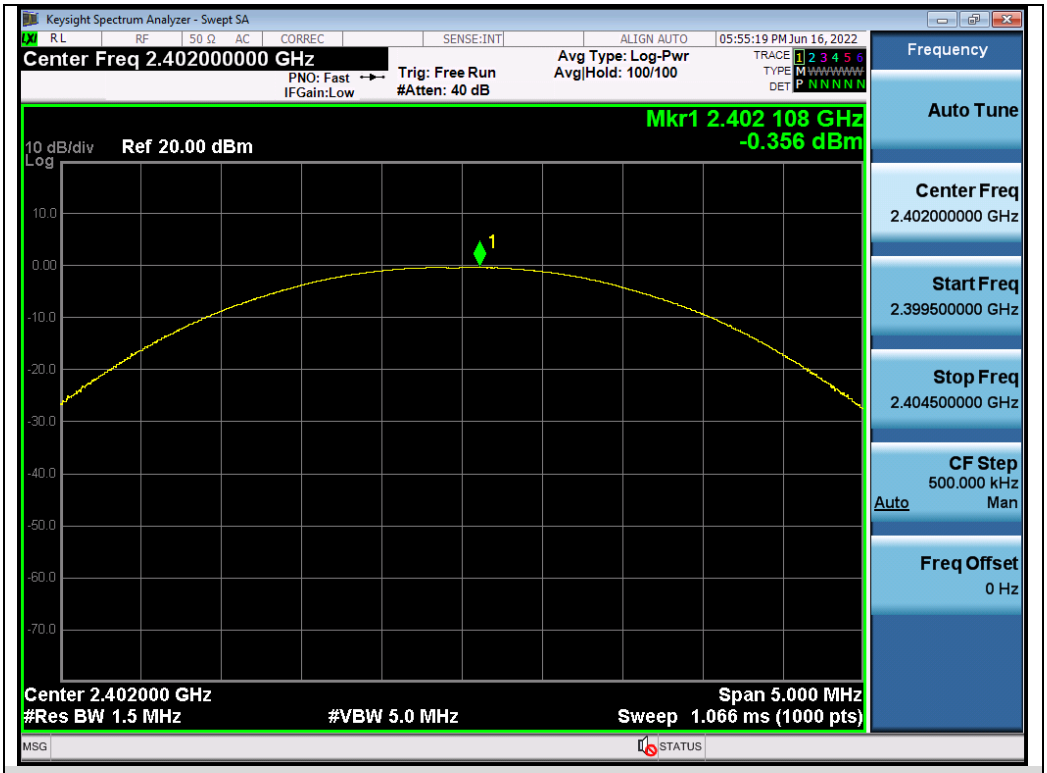
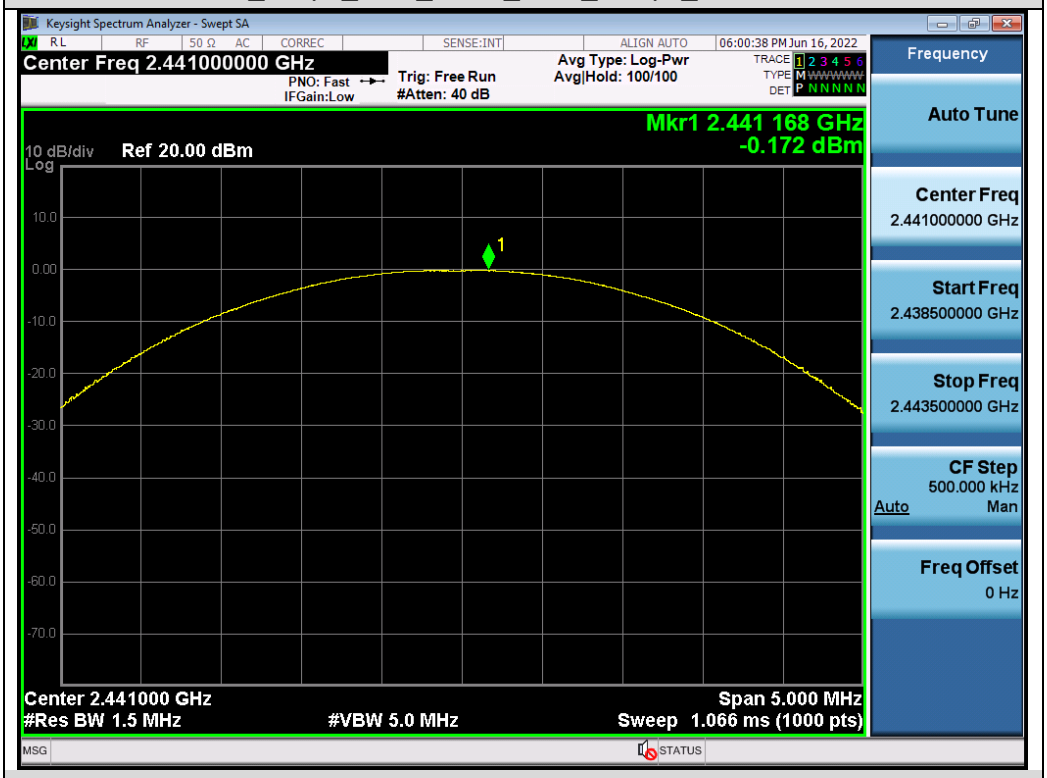



Test_Graph_EDR_ANT1_2402_2Mbps_Peak Power




Test_Graph_EDR_ANT1_2441_2Mbps_Peak Power

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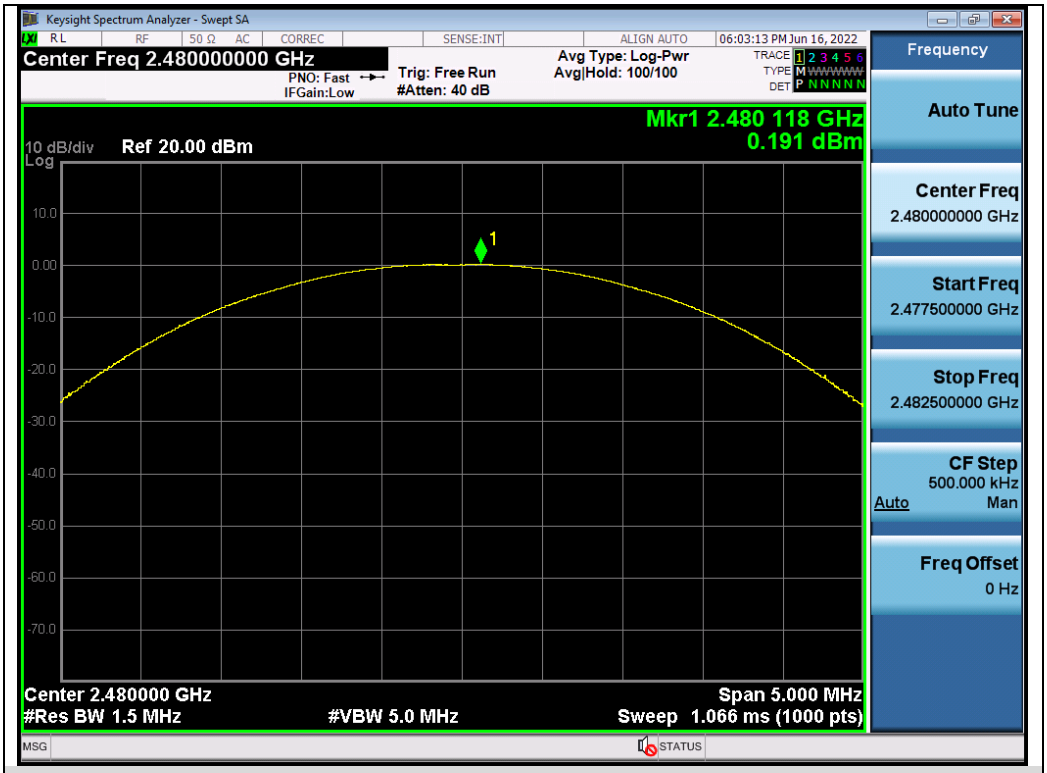
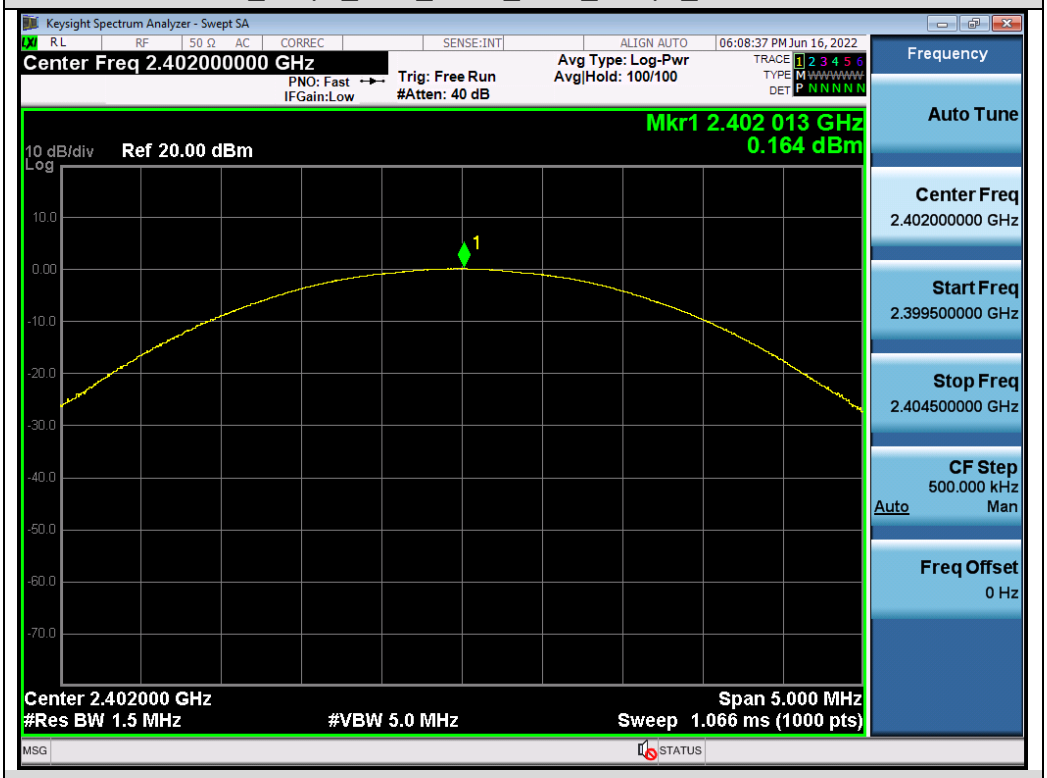



Test_Graph_EDR_ANT1_2480_2Mbps_Peak Power




Test_Graph_EDR_ANT1_2402_3Mbps_Peak Power

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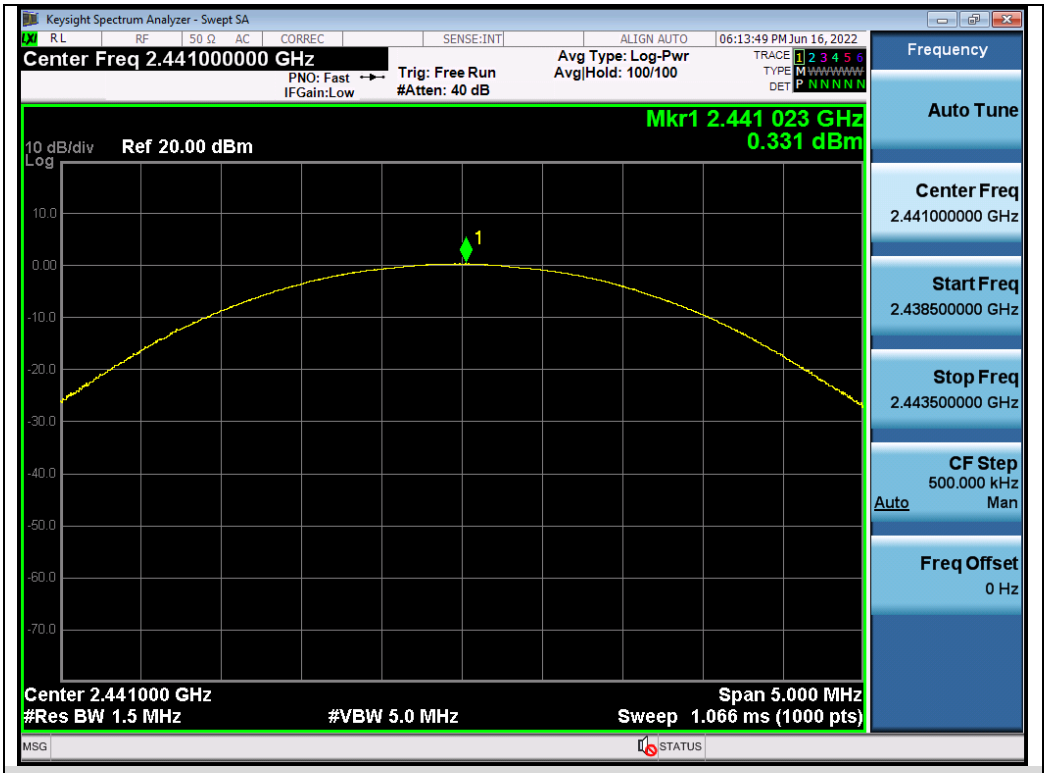
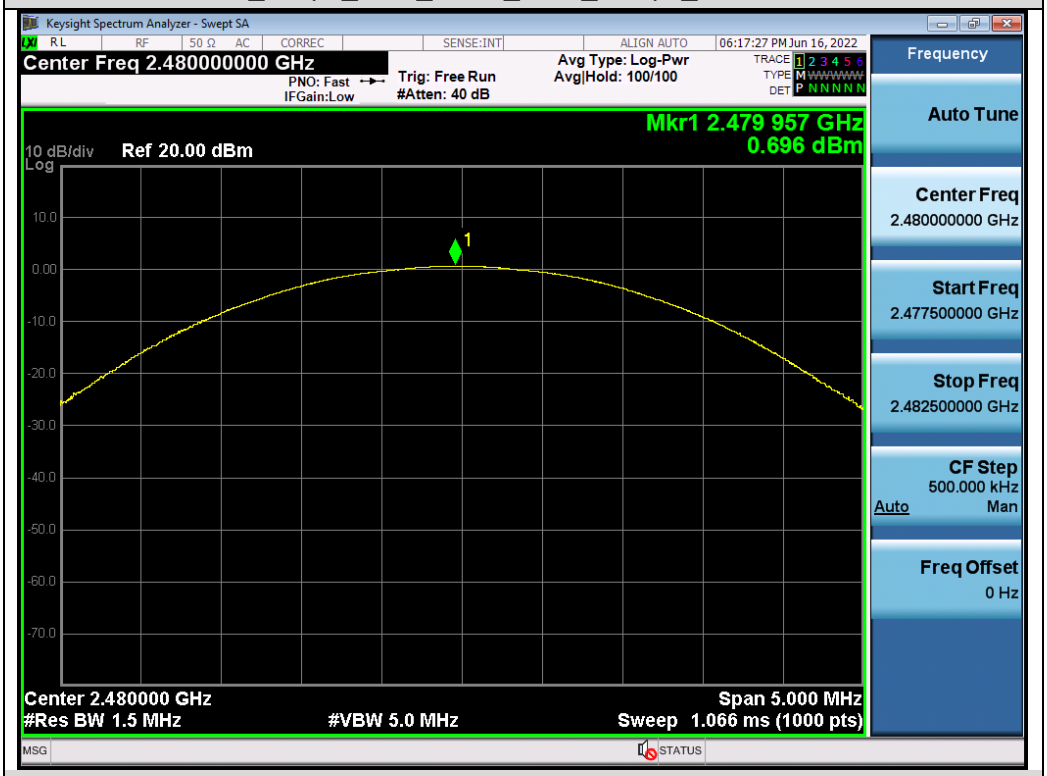



Test_Graph_EDR_ANT1_2441_3Mbps_Peak Power




Test_Graph_EDR_ANT1_2480_3Mbps_Peak Power

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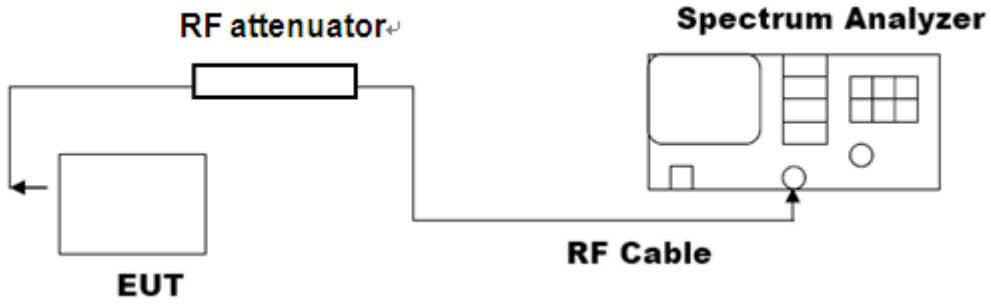
# 8. 20DB BANDWIDTH

## 8.1. MEASUREMENT PROCEDURE

1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
2, Set the EUT Work on the top, the middle and the bottom operation frequency individually.
3. Set Span = approximately 2 to 5 times the 20 dB bandwidth, centered on a hoping channel
   The nominal IF filter bandwidth (3 dB RBW) shall be in the range of 1% to 5% of the OBW and video bandwidth (VBW) shall be approximately three times RBW; Sweep = auto; Detector function = peak
4. Set SPA Trace 1 Max hold, then View.

## 8.2. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)

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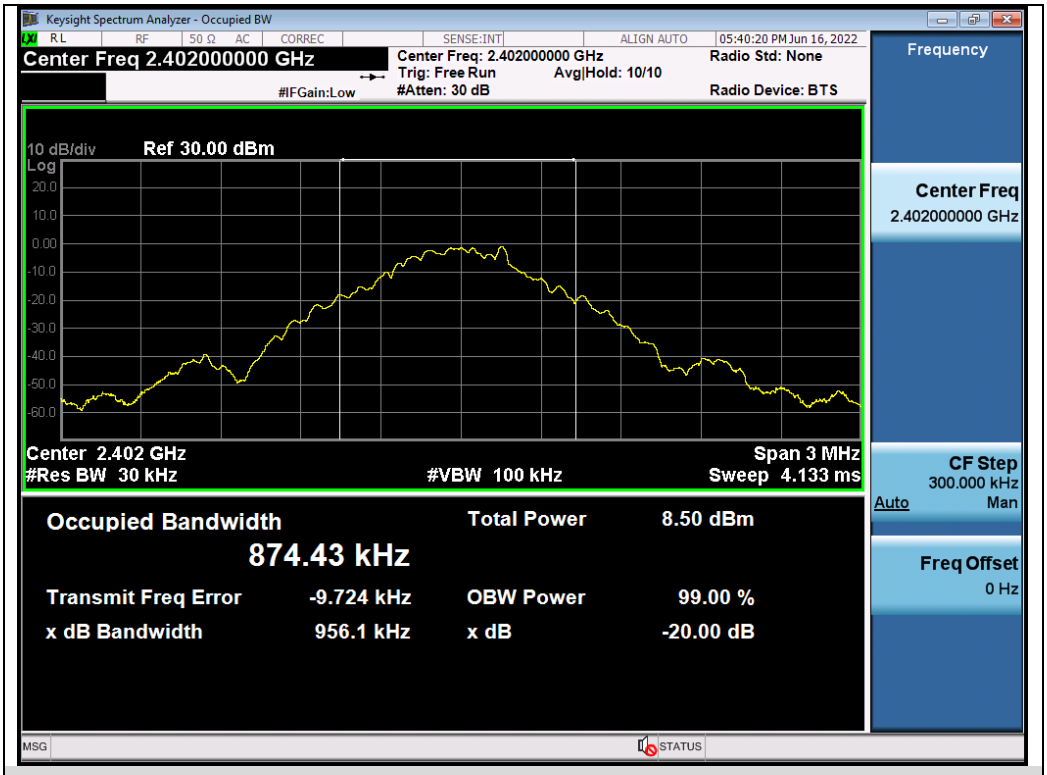
## 8.3. LIMITS AND MEASUREMENT RESULTS

| Test Data of Occupied Bandwidth and -20dB Bandwidth | | | | | |
|---|---|---|---|---|---|
| Test Mode | Test Channel (MHz) | 99% Occupied Bandwidth (MHz) | -20dB Bandwidth (MHz) | Limits | Pass or Fail |
| GFSK | 2402 | 0.874 | 0.956 | N/A | Pass |
| | 2441 | 0.875 | 0.956 | N/A | Pass |
| | 2480 | 0.871 | 0.956 | N/A | Pass |
| π /4-DQPSK | 2402 | 1.188 | 1.333 | N/A | Pass |
| | 2441 | 1.188 | 1.331 | N/A | Pass |
| | 2480 | 1.189 | 1.333 | N/A | Pass |
| 8DPSK | 2402 | 1.188 | 1.307 | N/A | Pass |
| | 2441 | 1.188 | 1.307 | N/A | Pass |
| | 2480 | 1.188 | 1.306 | N/A | Pass |

**Test Graphs of Occupied Bandwidth and -20 Bandwidth**




Test_Graph_BR_ANT1_2402_1Mbps_OBW

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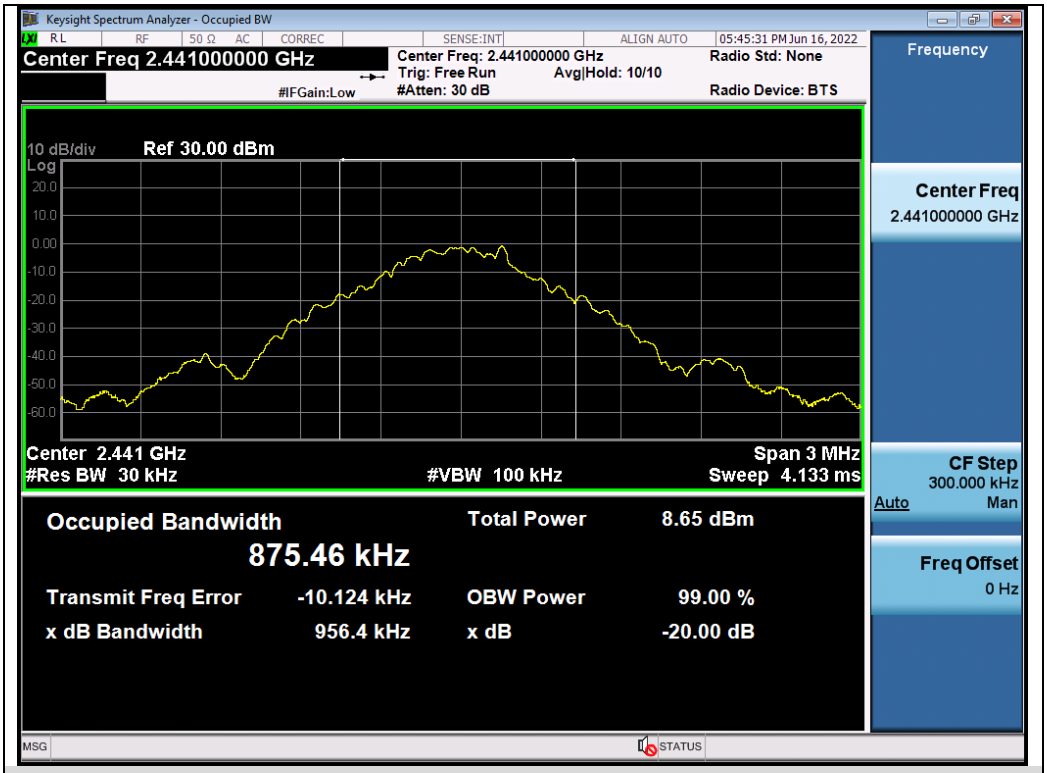
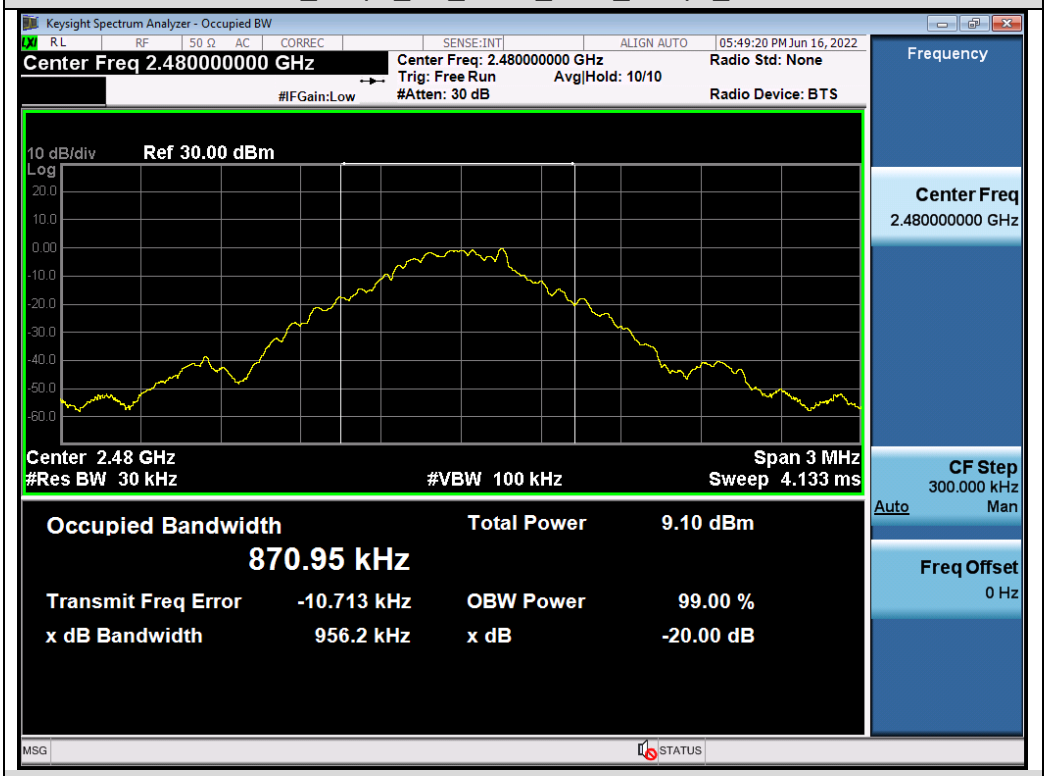



Test_Graph_BR_ANT1_2441_1Mbps_OBW




Test_Graph_BR_ANT1_2480_1Mbps_OBW

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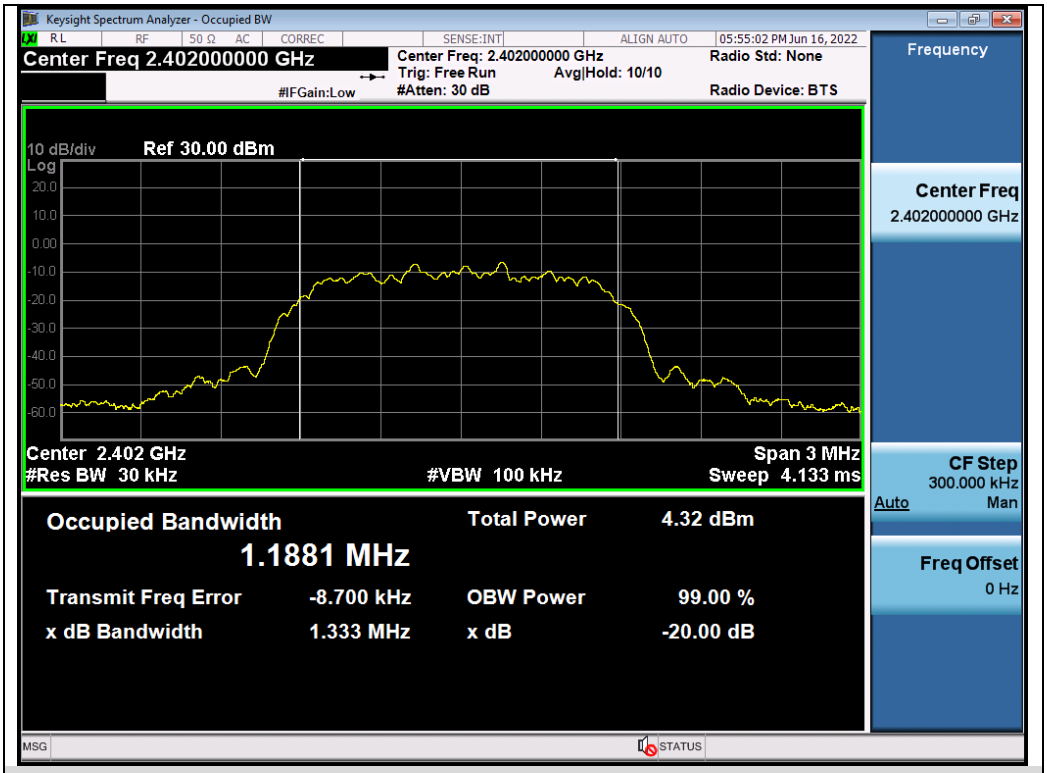
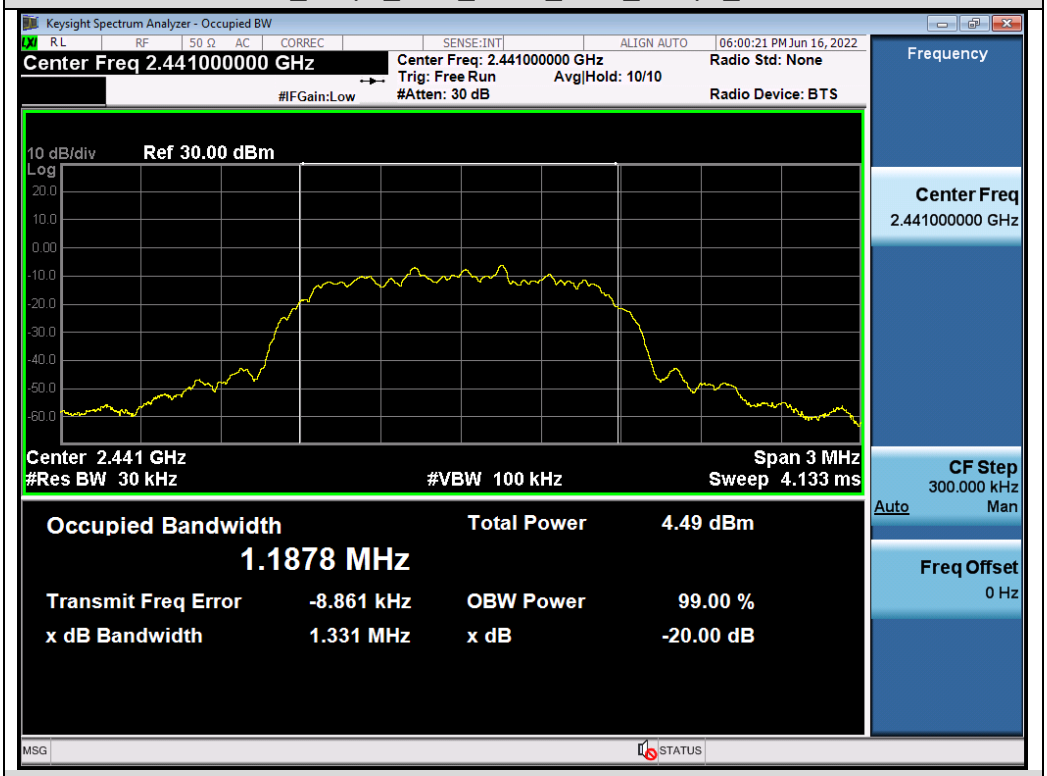



Test_Graph_EDR_ANT1_2402_2Mbps_OBW




Test_Graph_EDR_ANT1_2441_2Mbps_OBW

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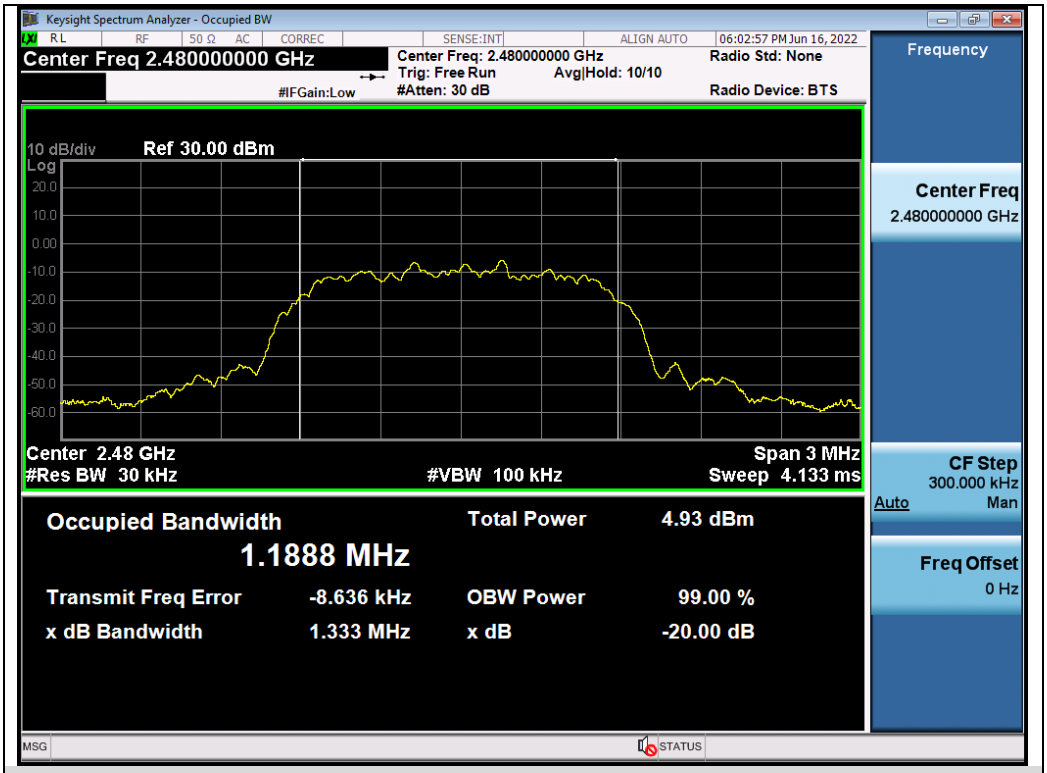


Test_Graph_EDR_ANT1_2480_2Mbps_OBW

Test_Graph_EDR_ANT1_2402_3Mbps_OBW

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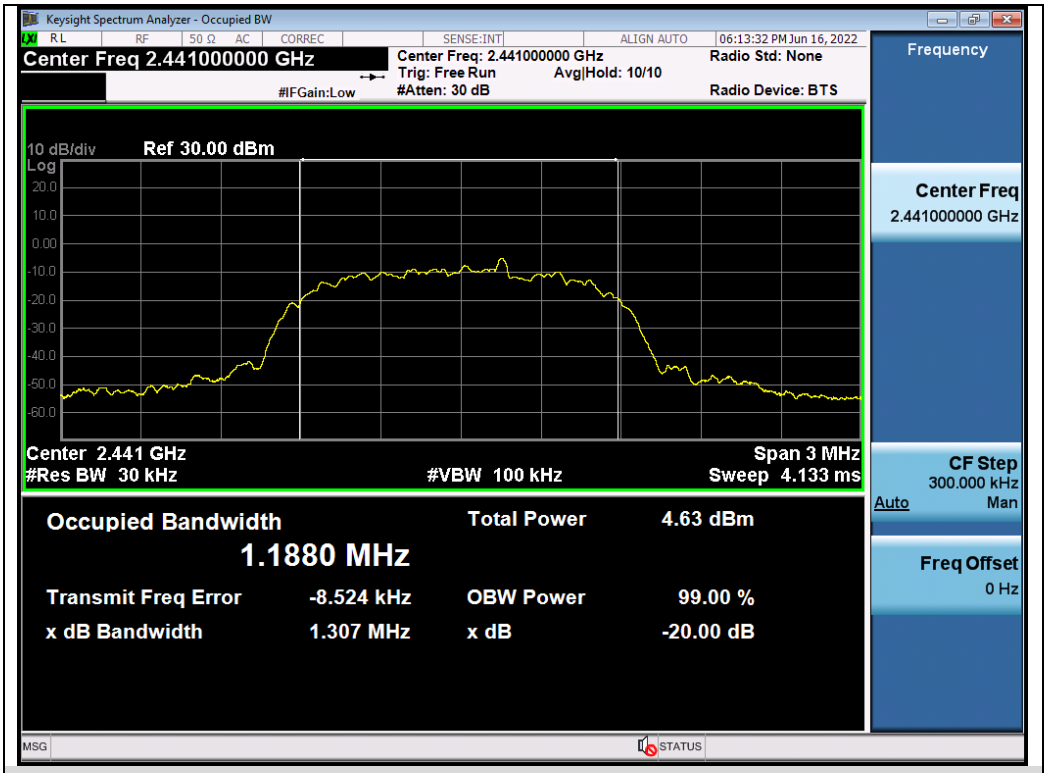
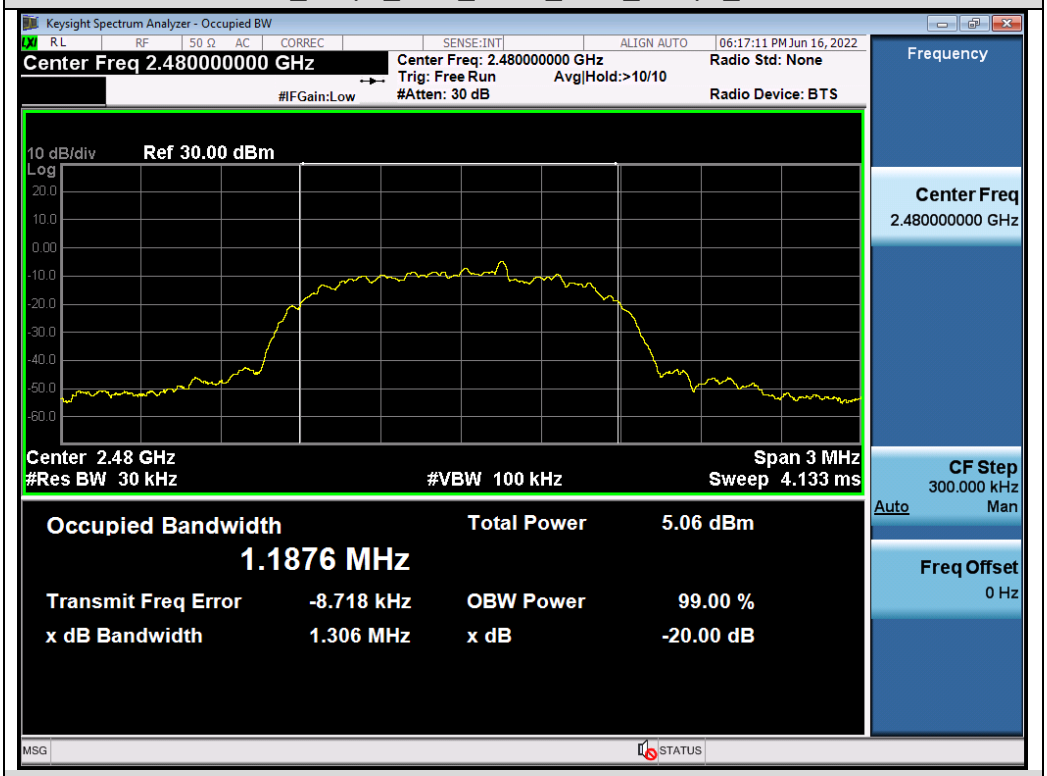



Test_Graph_EDR_ANT1_2441_3Mbps_OBW




Test_Graph_EDR_ANT1_2480_3Mbps_OBW

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# 9. CONDUCTED SPURIOUS EMISSION

## 9.1. MEASUREMENT PROCEDURE

1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
2. Set the EUT Work on the top, the Middle and the bottom operation frequency individually.
3. Set the Span = wide enough to capture the peak level of the in-band emission and all spurious emissions from the lowest frequency generated in the EUT up through the 10th harmonic.
   RBW = 100 kHz; VBW= 300 kHz; Sweep = auto; Detector function = peak.
4. Set SPA Trace 1 Max hold, then View.

## 9.2. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)

The same as described in section 8.2

## 9.3. MEASUREMENT EQUIPMENT USED

The same as described in section 6

## 9.4. LIMITS AND MEASUREMENT RESULT

| LIMITS AND MEASUREMENT RESULT | | |
|---|---|---|
| **Applicable Limits** | **Measurement Result** | |
| | **Test Data** | **Criteria** |
| In any 100 kHz Bandwidth Outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produce by the intentional radiator shall be at least 20 dB below that in 100KHz bandwidth within the band that contains the highest level of the desired power.<br>In addition, radiation emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in§15.209(a)) | At least -20dBc than the limit Specified on the BOTTOM Channel | PASS |
| | At least -20dBc than the limit Specified on the TOP Channel | PASS |

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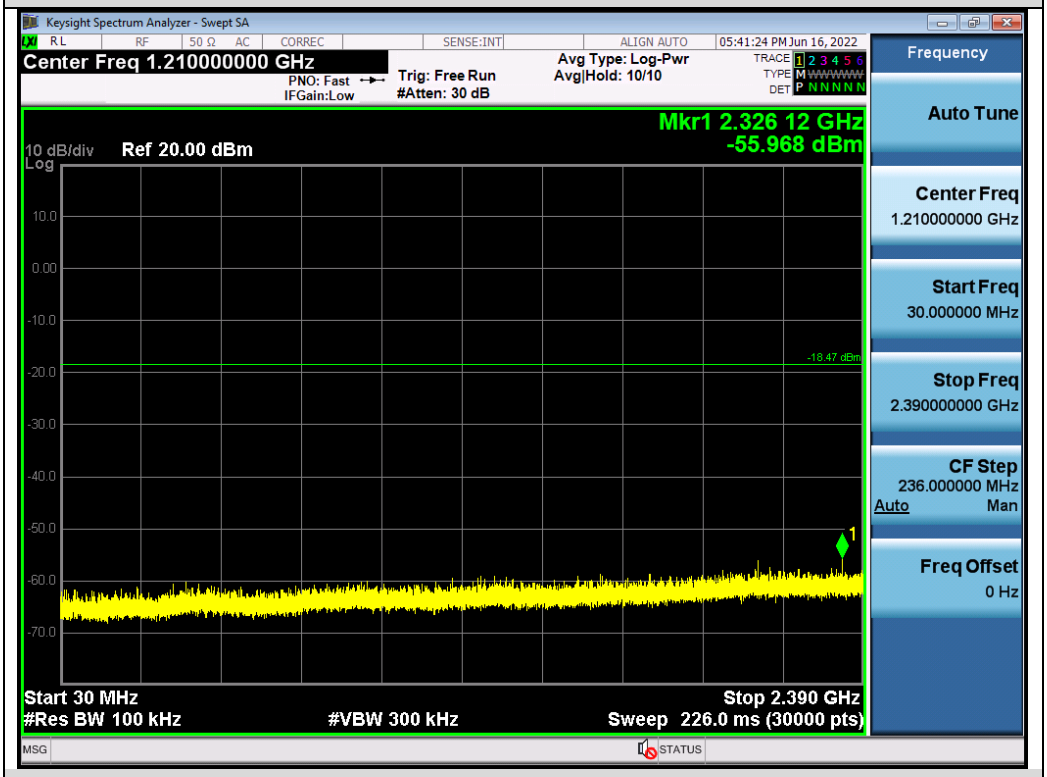
## Test Graphs of Spurious Emissions in Non-Restricted Frequency Bands

Test_Graph_BR_ANT1_2402_1Mbps_Reference Level




Test_Graph_BR_ANT1_2402_1Mbps_Lower Band Emissions

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Test_Graph_BR_ANT1_2402_1Mbps_Higher Band Emissions

Test_Graph_BR_ANT1_2441_1Mbps_Reference Level

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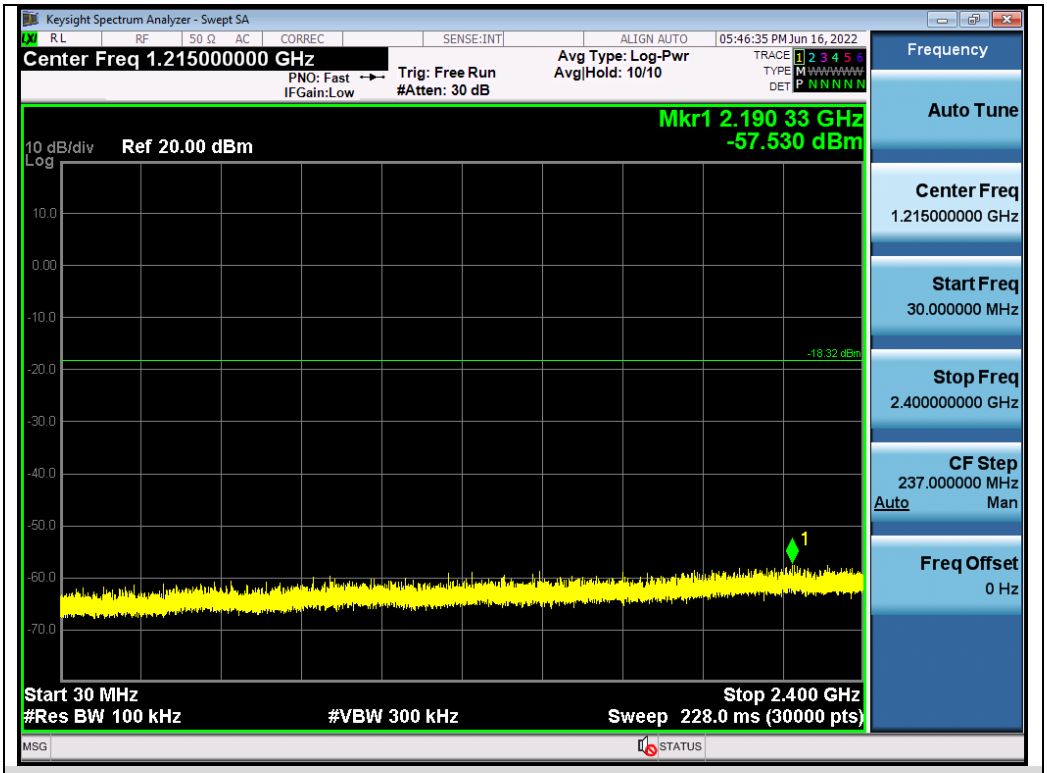
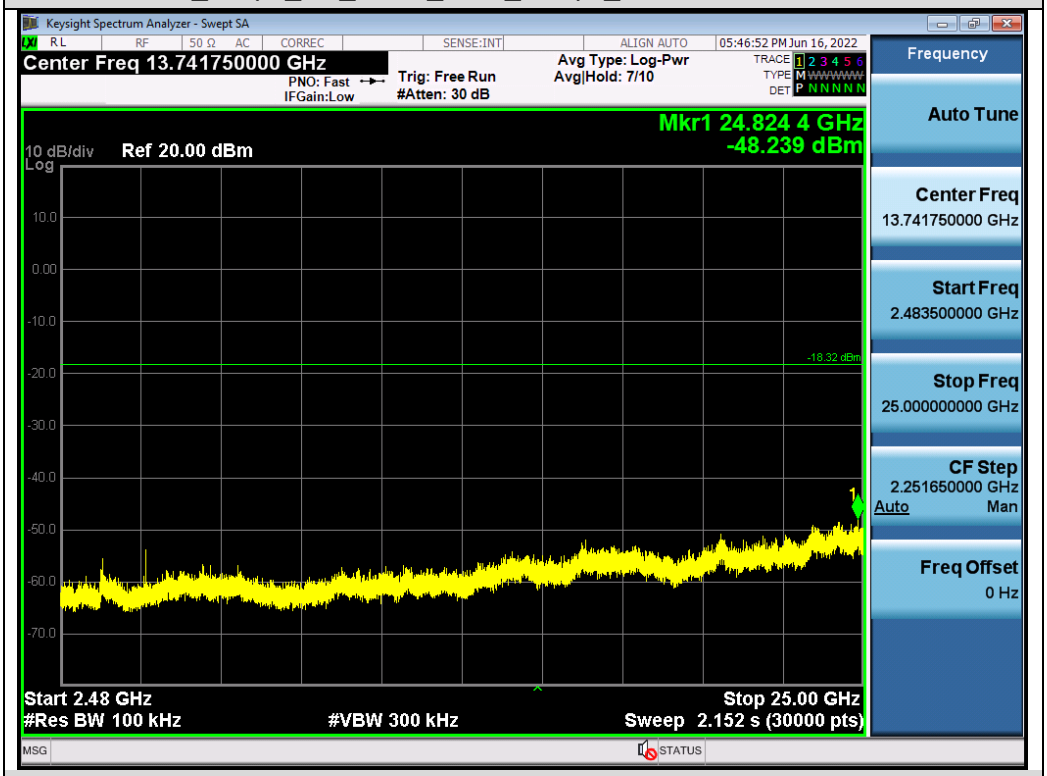



Test_Graph_BR_ANT1_2441_1Mbps_Lower Band Emissions




Test_Graph_BR_ANT1_2441_1Mbps_Higher Band Emissions

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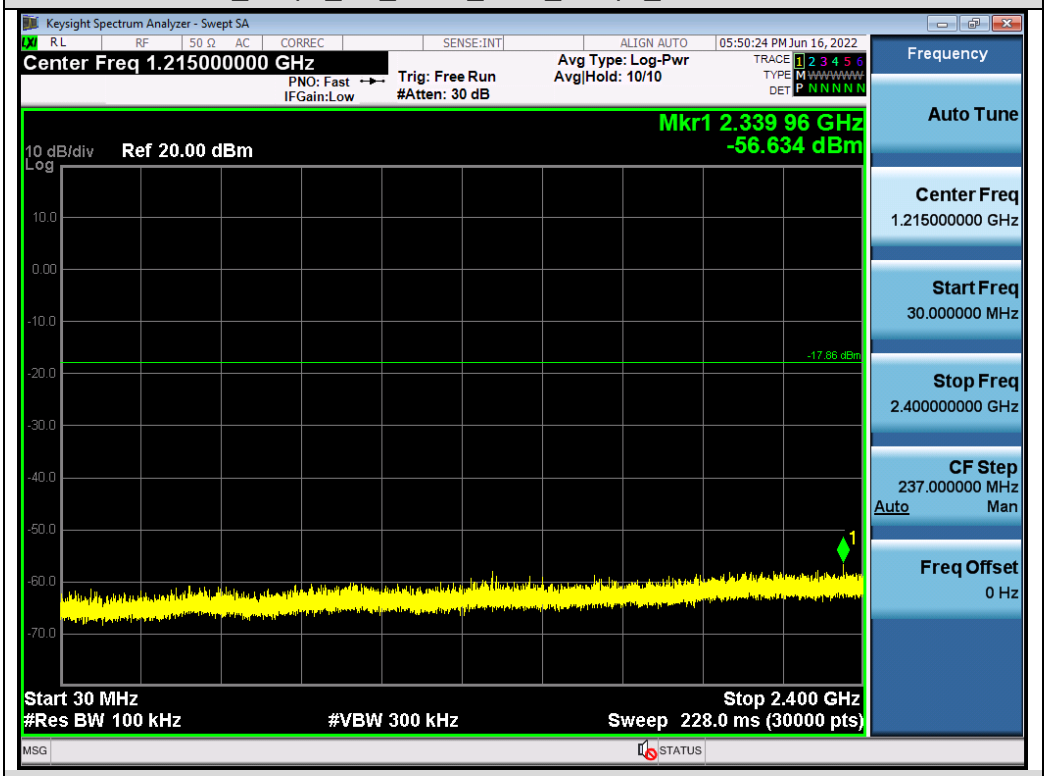
Test_Graph_BR_ANT1_2480_1Mbps_Reference Level




Test_Graph_BR_ANT1_2480_1Mbps_Lower Band Emissions

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Test_Graph_BR_ANT1_2480_1Mbps_Higher Band Emissions

Test_Graph_EDR_ANT1_2402_2Mbps_Reference Level

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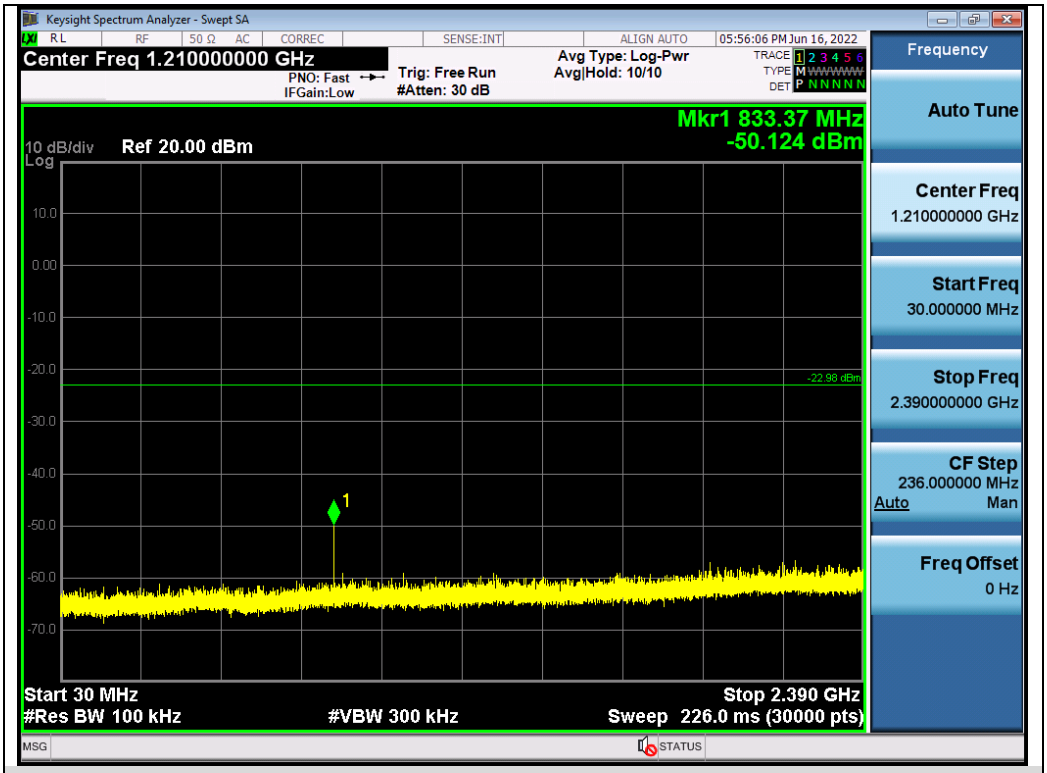


Test_Graph_EDR_ANT1_2402_2Mbps_Lower Band Emissions

Test_Graph_EDR_ANT1_2402_2Mbps_Higher Band Emissions

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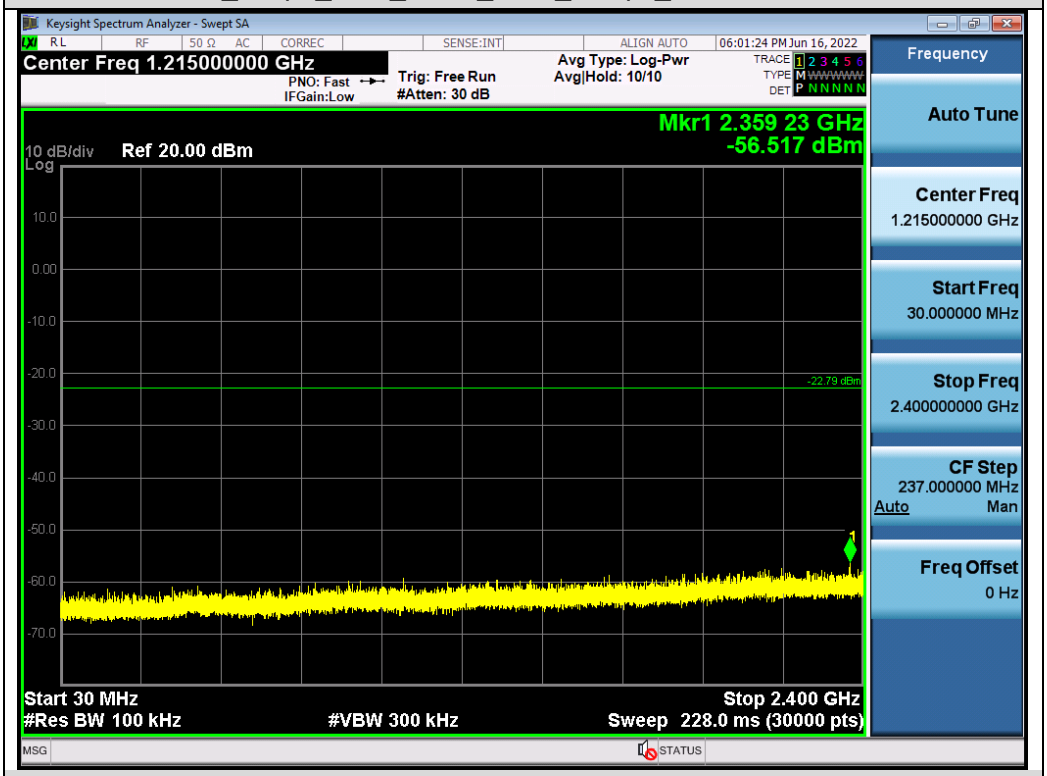
Test_Graph_EDR_ANT1_2441_2Mbps_Reference Level




Test_Graph_EDR_ANT1_2441_2Mbps_Lower Band Emissions

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Test_Graph_EDR_ANT1_2441_2Mbps_Higher Band Emissions

Test_Graph_EDR_ANT1_2480_2Mbps_Reference Level

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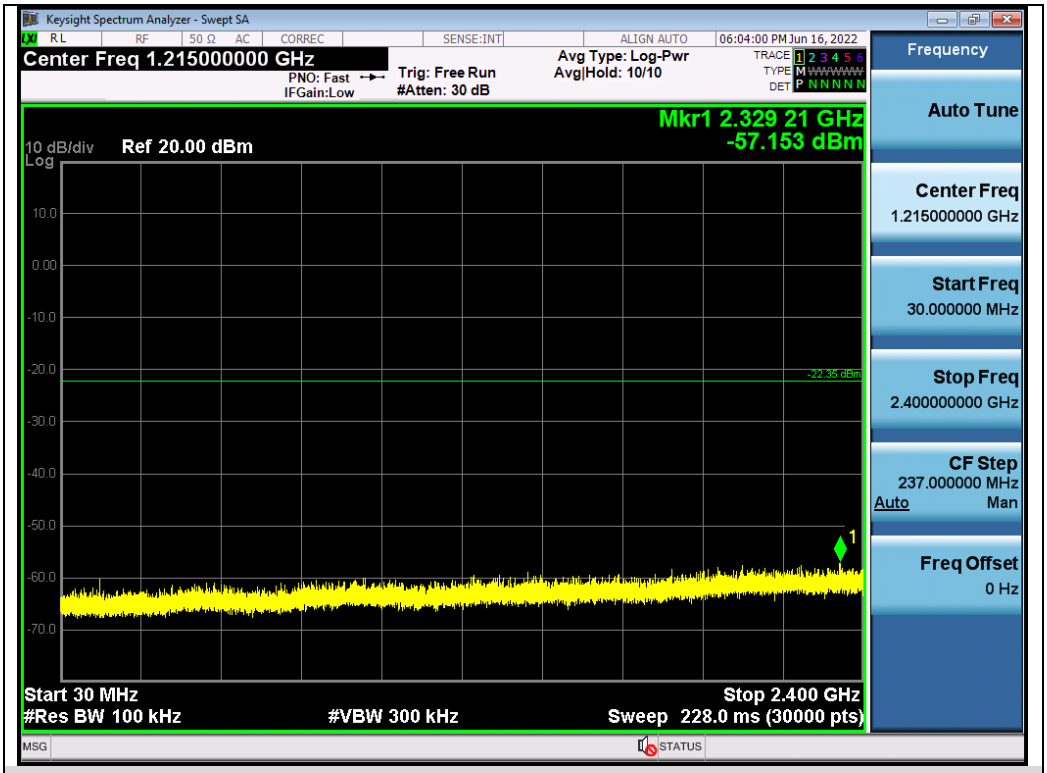
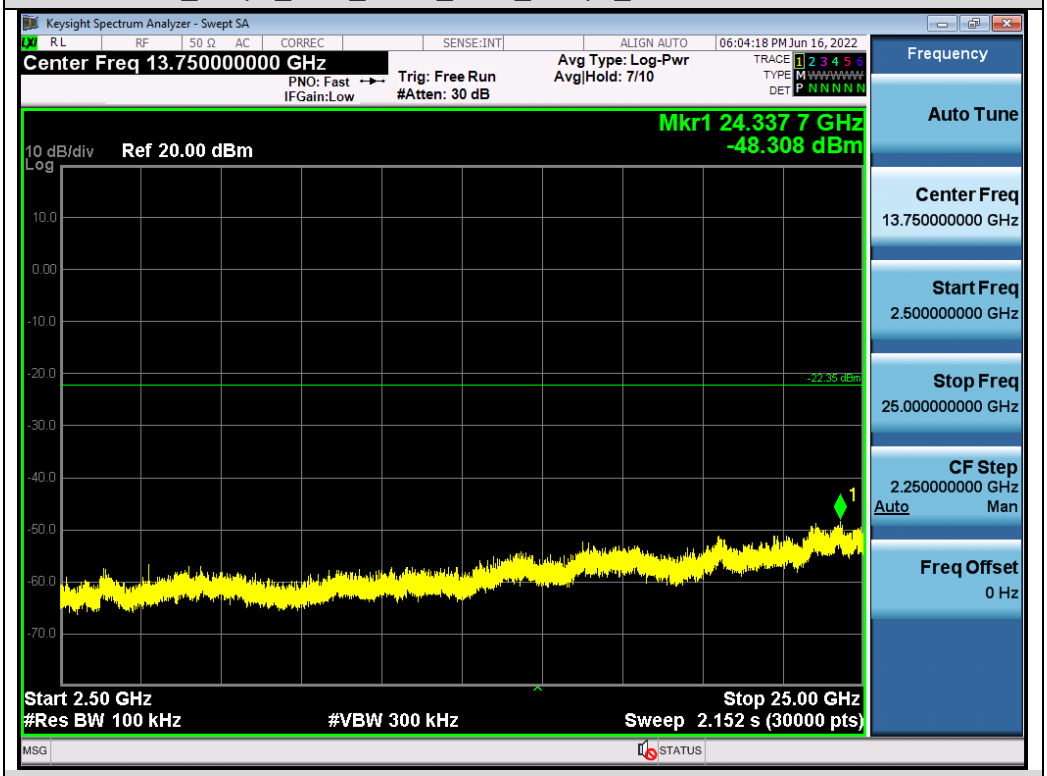



Test_Graph_EDR_ANT1_2480_2Mbps_Lower Band Emissions




Test_Graph_EDR_ANT1_2480_2Mbps_Higher Band Emissions

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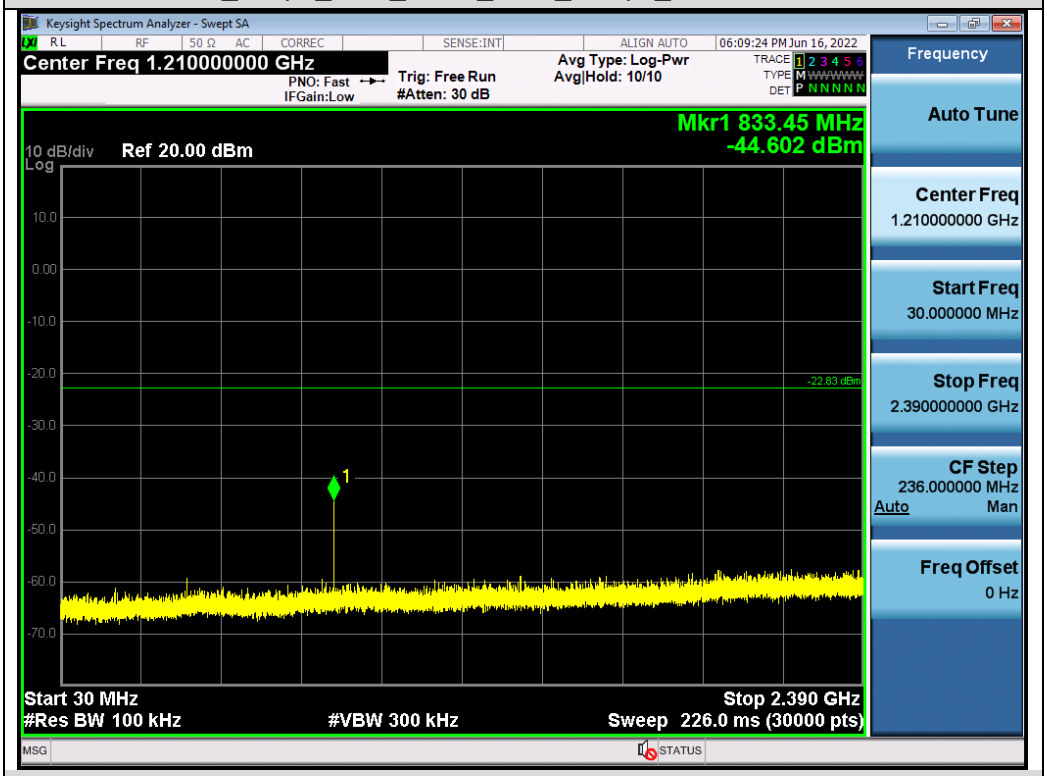
Test_Graph_EDR_ANT1_2402_3Mbps_Reference Level




Test_Graph_EDR_ANT1_2402_3Mbps_Lower Band Emissions

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Test_Graph_EDR_ANT1_2402_3Mbps_Higher Band Emissions

Test_Graph_EDR_ANT1_2441_3Mbps_Reference Level

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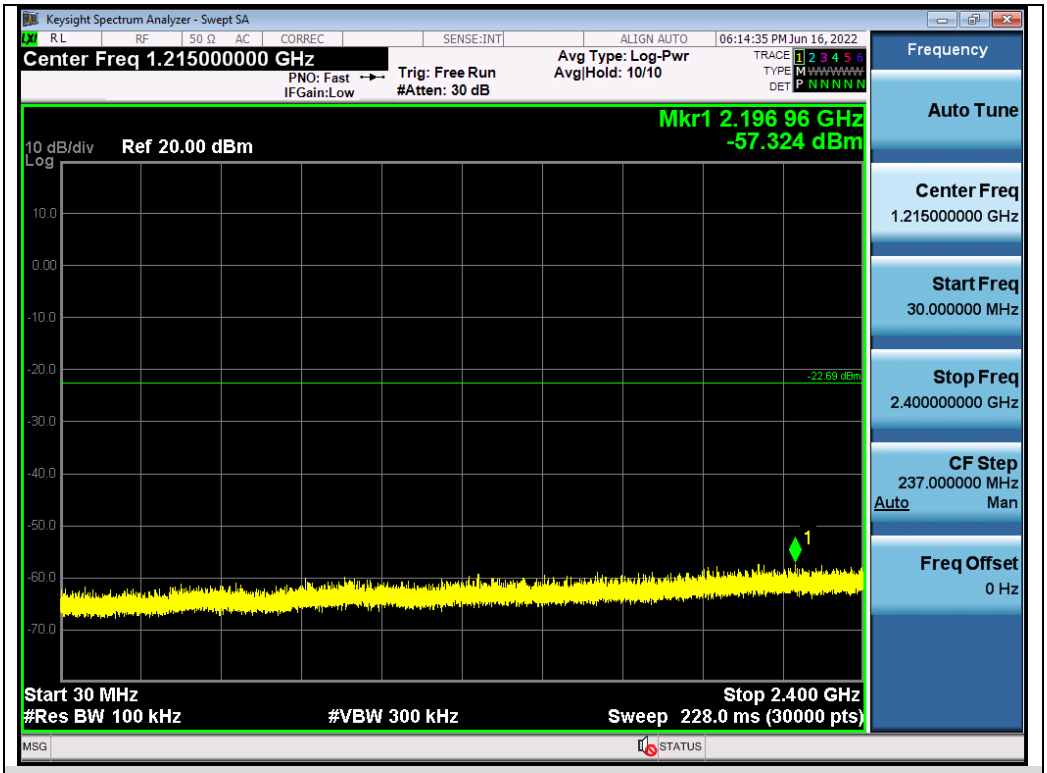


Test_Graph_EDR_ANT1_2441_3Mbps_Lower Band Emissions

Test_Graph_EDR_ANT1_2441_3Mbps_Higher Band Emissions

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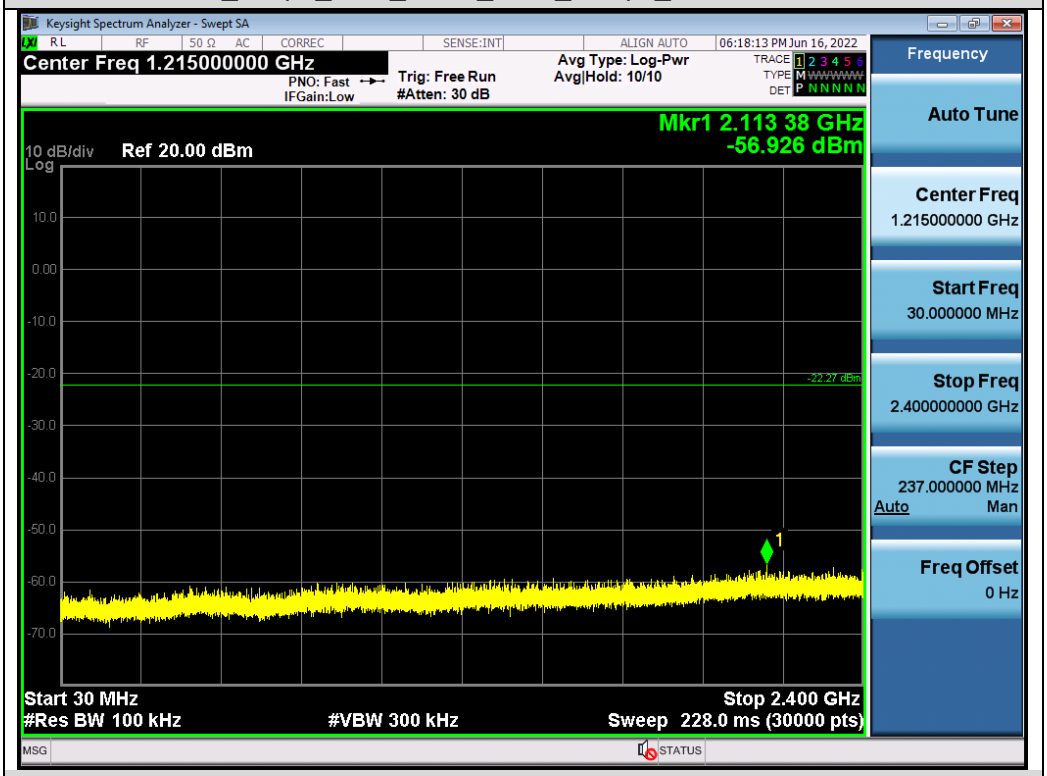
Test_Graph_EDR_ANT1_2480_3Mbps_Reference Level




Test_Graph_EDR_ANT1_2480_3Mbps_Lower Band Emissions

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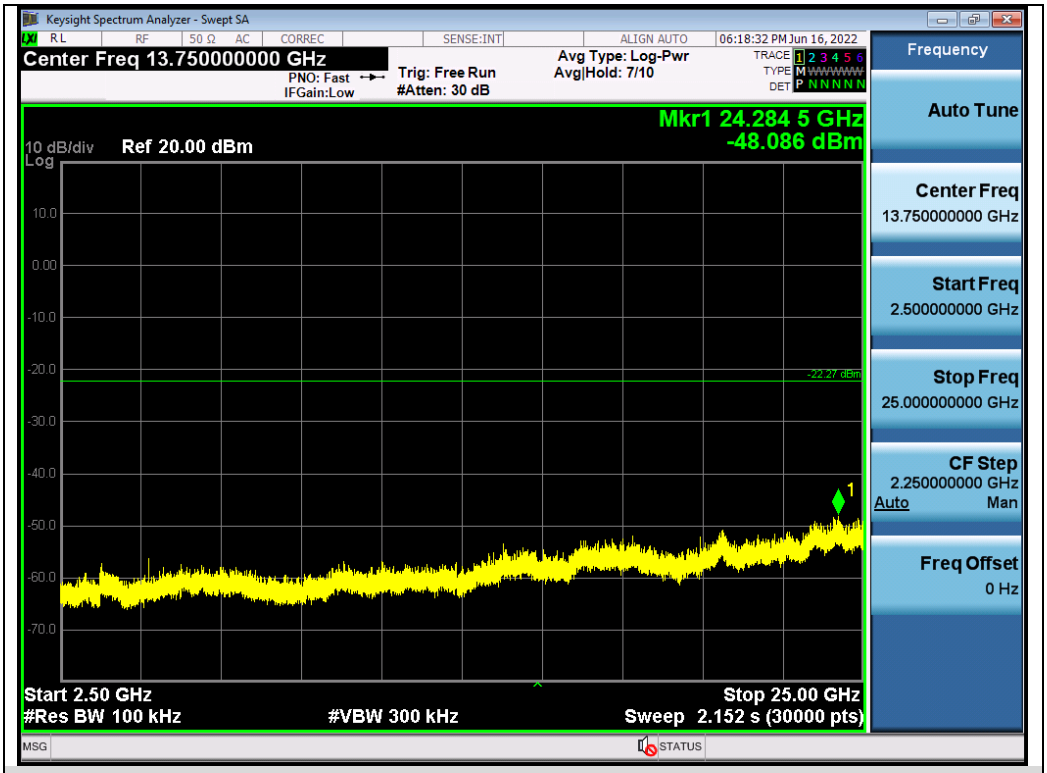


Test_Graph_EDR_ANT1_2480_3Mbps_Higher Band Emissions

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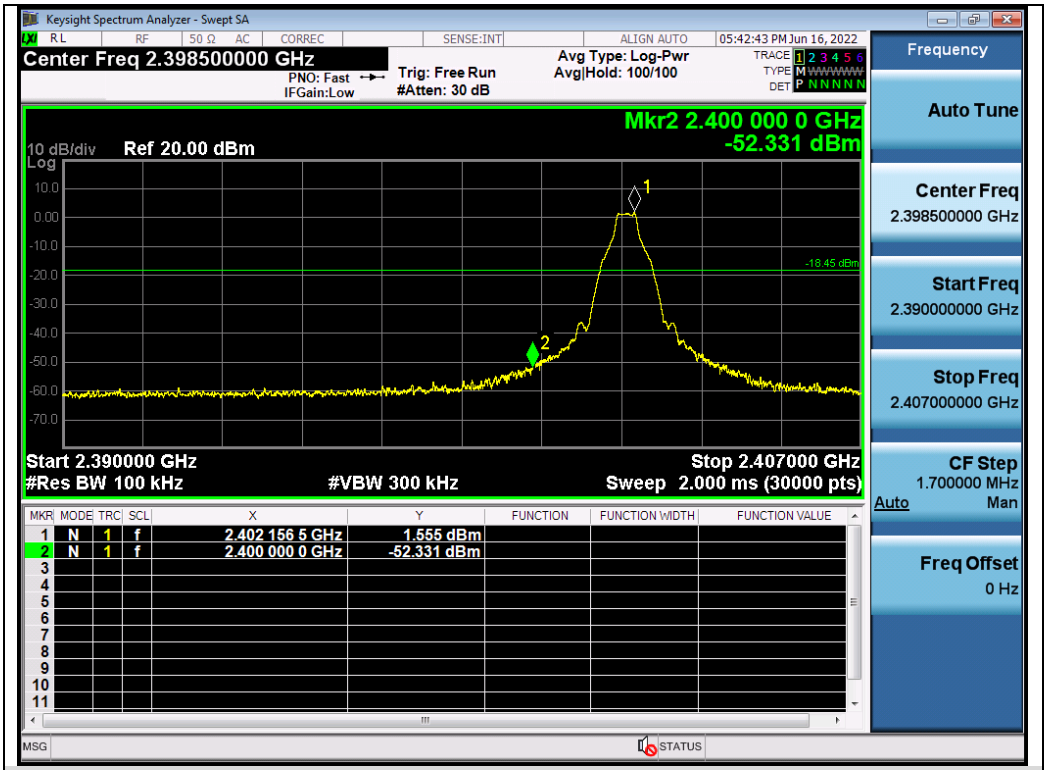
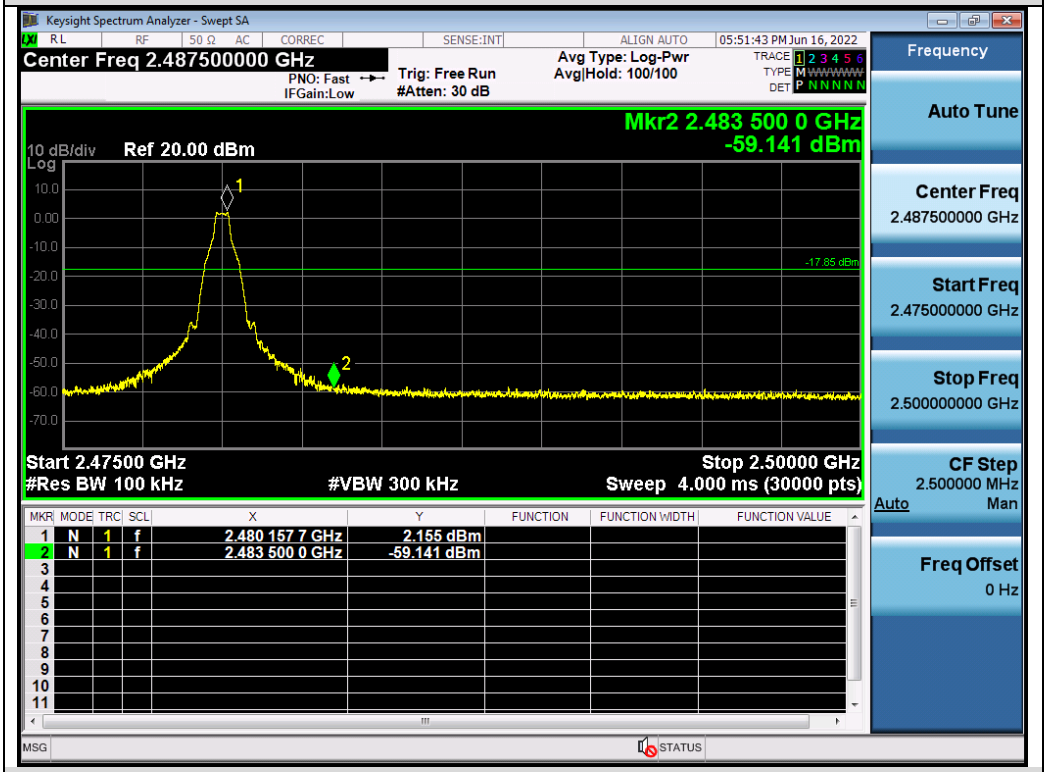
## Test Graphs of Band Edge Emissions in Non-Restricted Frequency Bands




Test_Graph_BR_ANT1_2402_1Mbps_Lower Band Edge Emissions




Test_Graph_BR_ANT1_2480_1Mbps_Higher Band Edge Emissions

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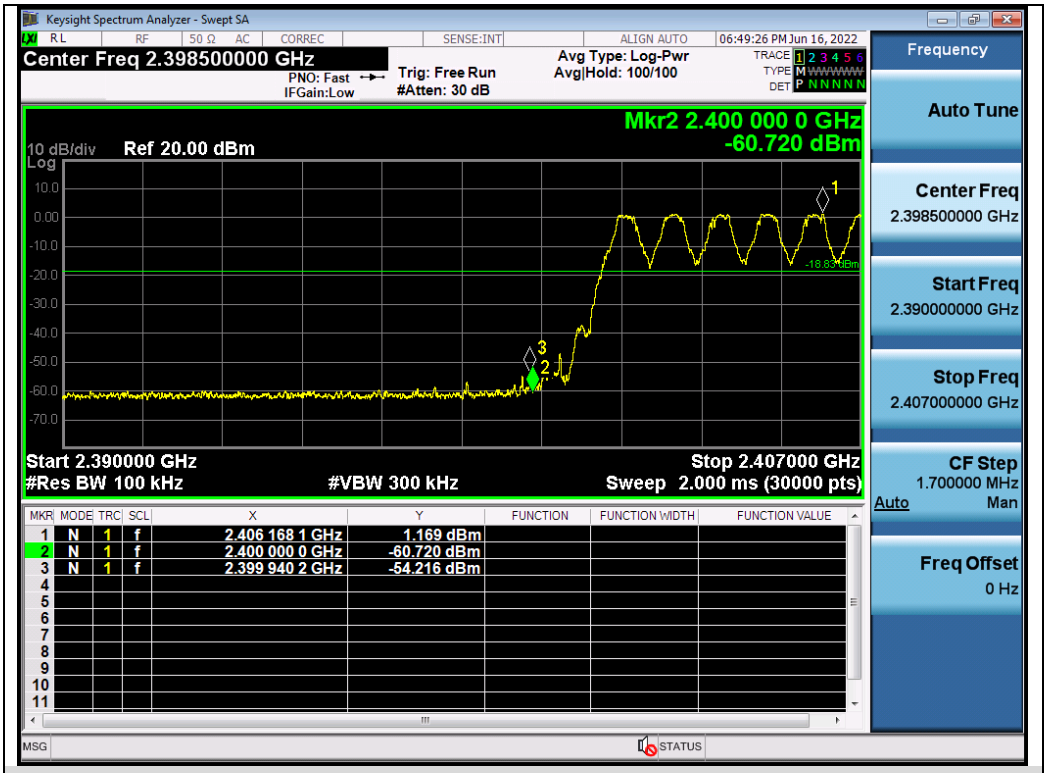
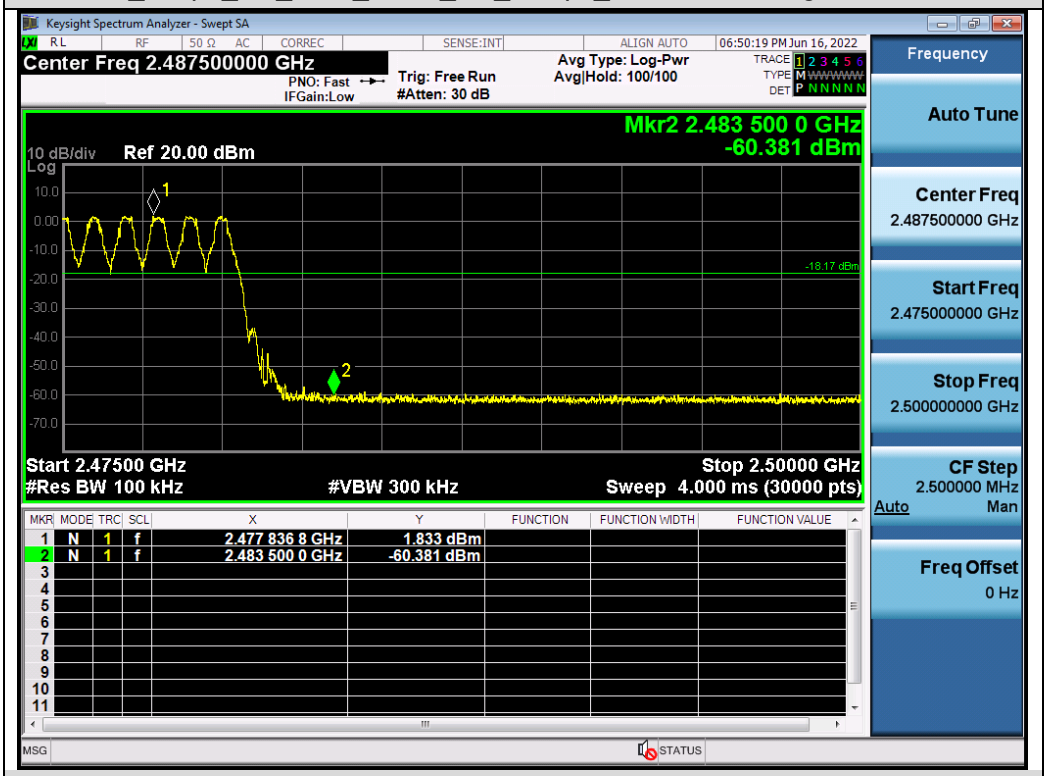



Test_Graph_BR_HOP_ANT1_NA_1Mbps_Lower Band Edge Emissions




Test_Graph_BR_HOP_ANT1_NA_1Mbps_Higher Band Edge Emissions

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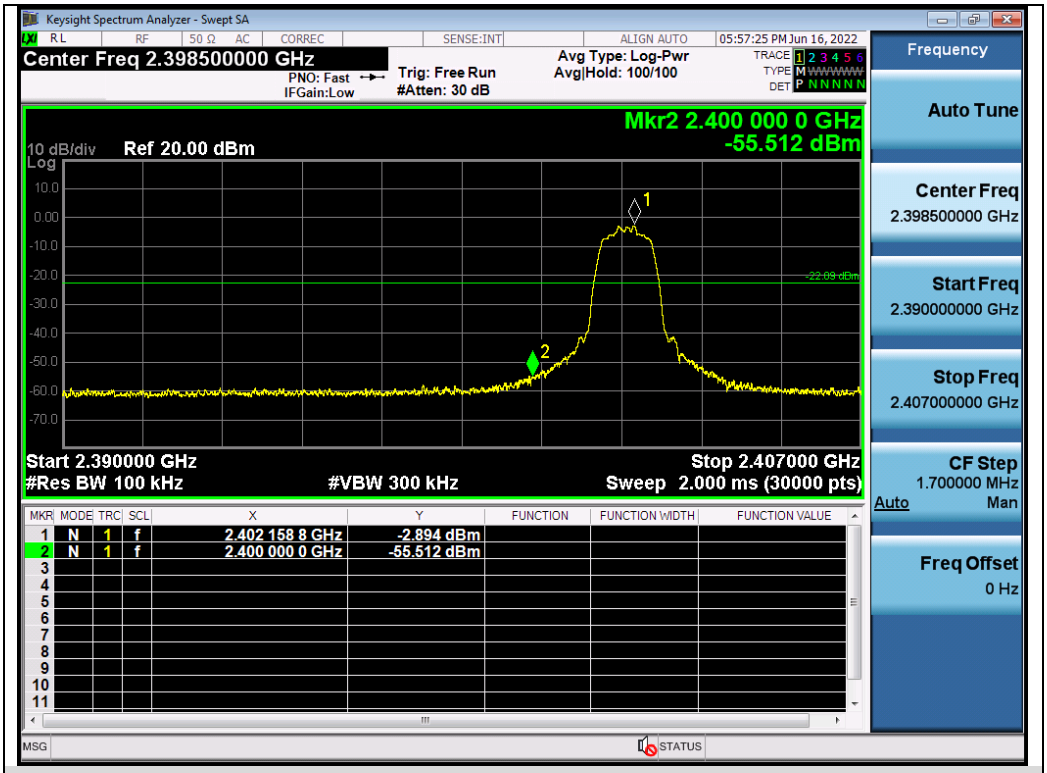
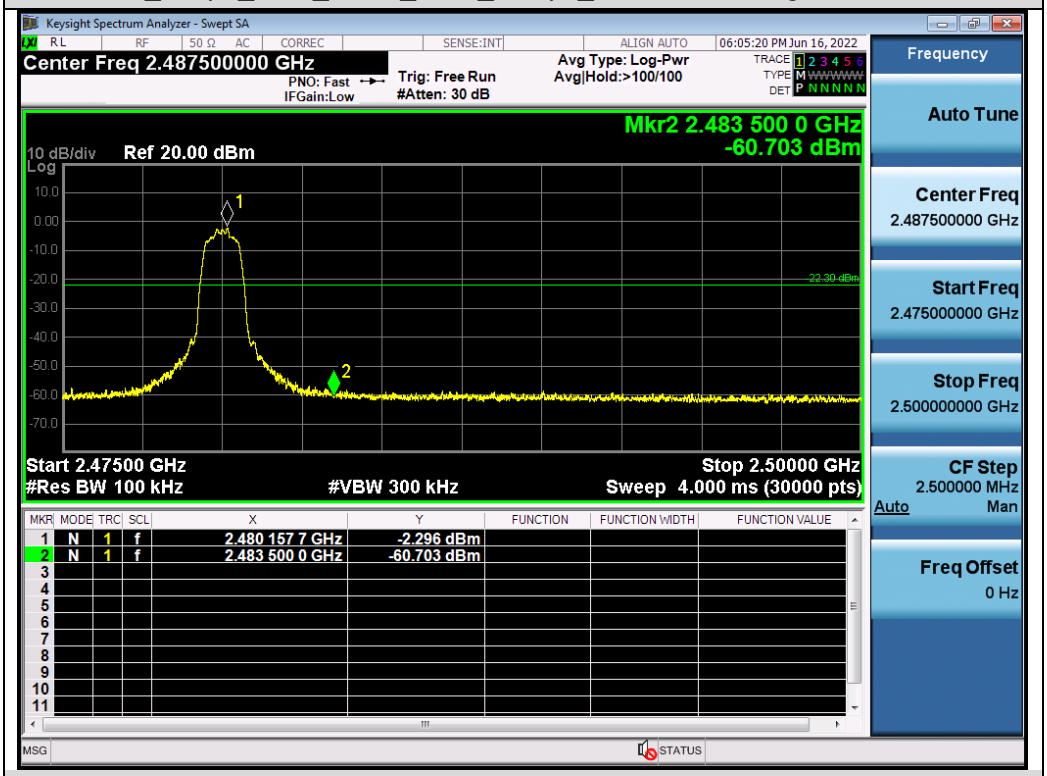



Test_Graph_EDR_ANT1_2402_2Mbps_Lower Band Edge Emissions




Test_Graph_EDR_ANT1_2480_2Mbps_Higher Band Edge Emissions

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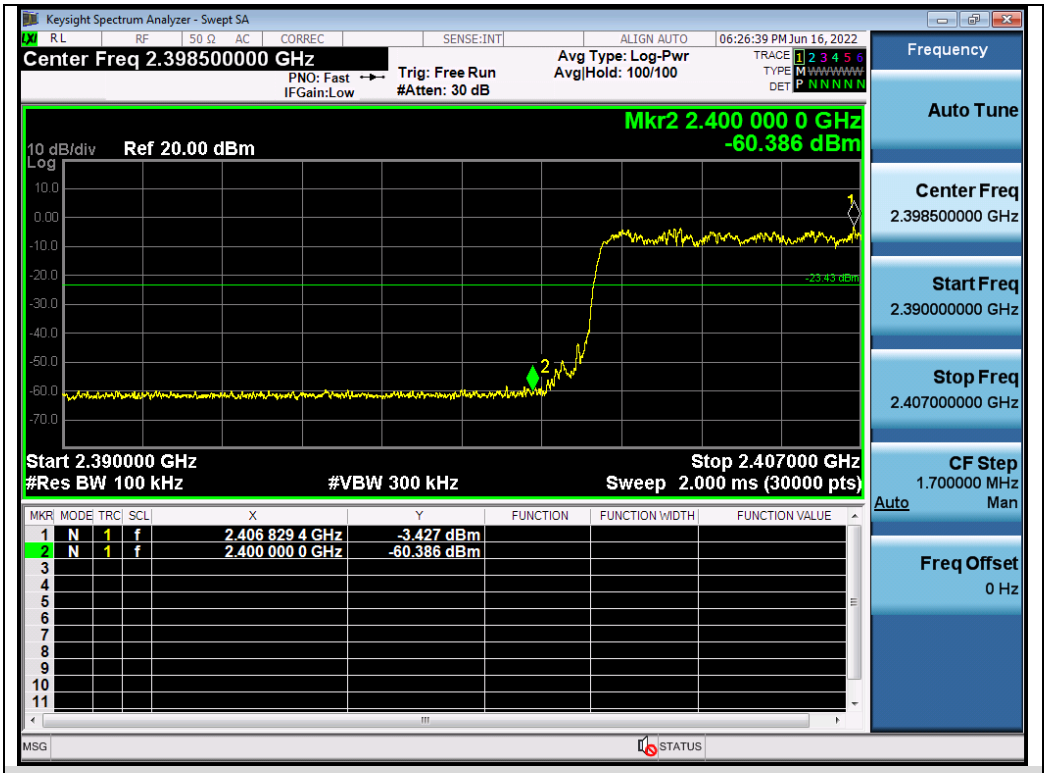
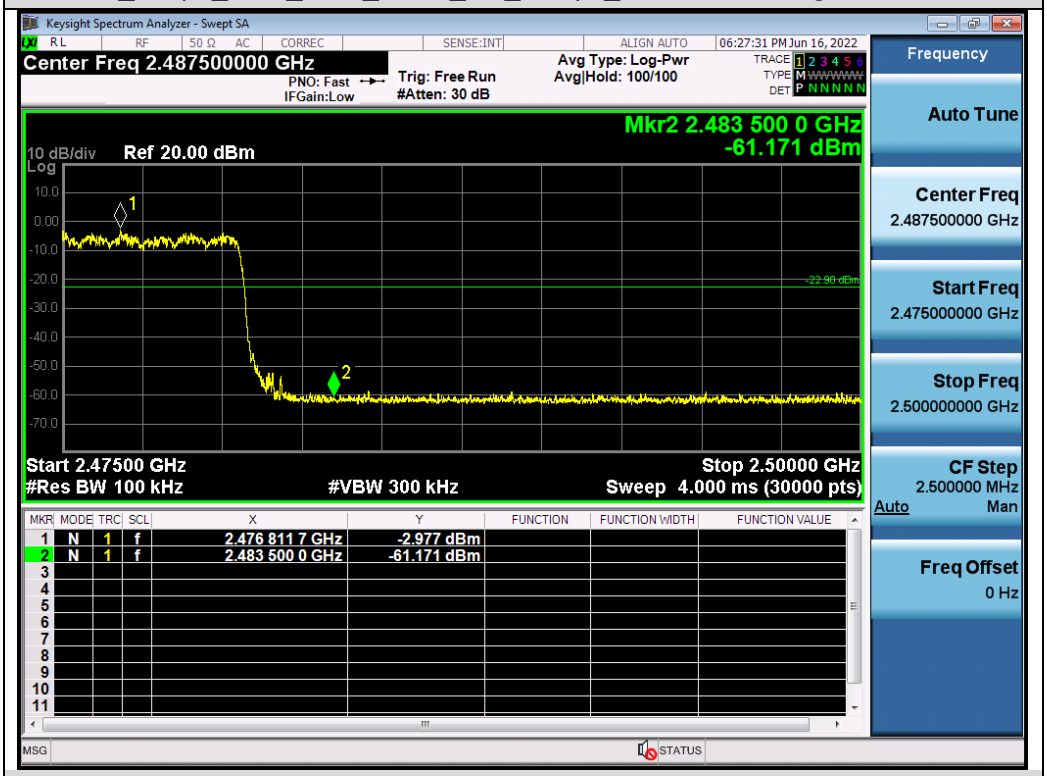



Test_Graph_EDR_HOP_ANT1_NA_2Mbps_Lower Band Edge Emissions




Test_Graph_EDR_HOP_ANT1_NA_2Mbps_Higher Band Edge Emissions

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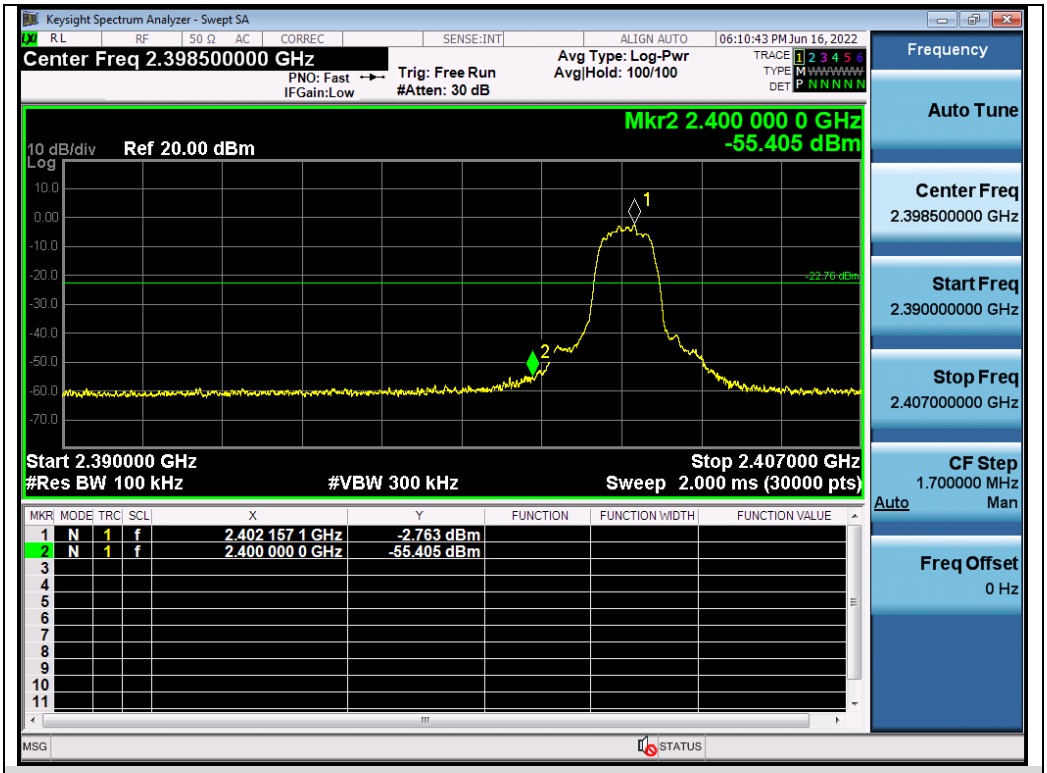
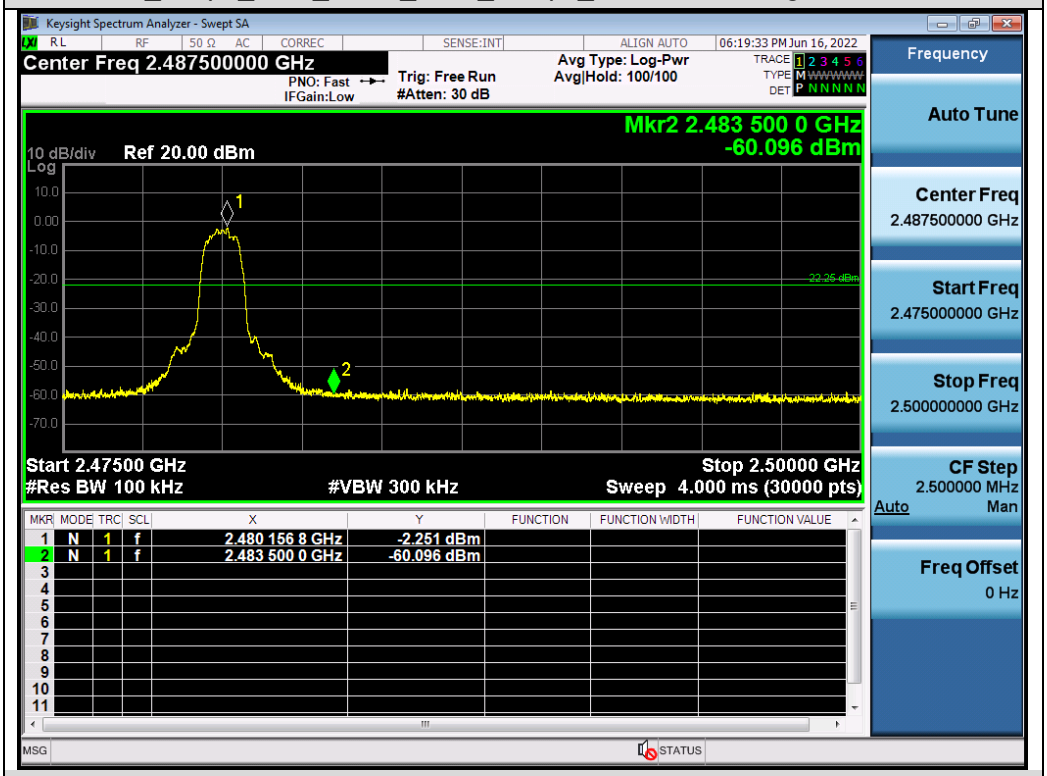



Test_Graph_EDR_ANT1_2402_3Mbps_Lower Band Edge Emissions




Test_Graph_EDR_ANT1_2480_3Mbps_Higher Band Edge Emissions

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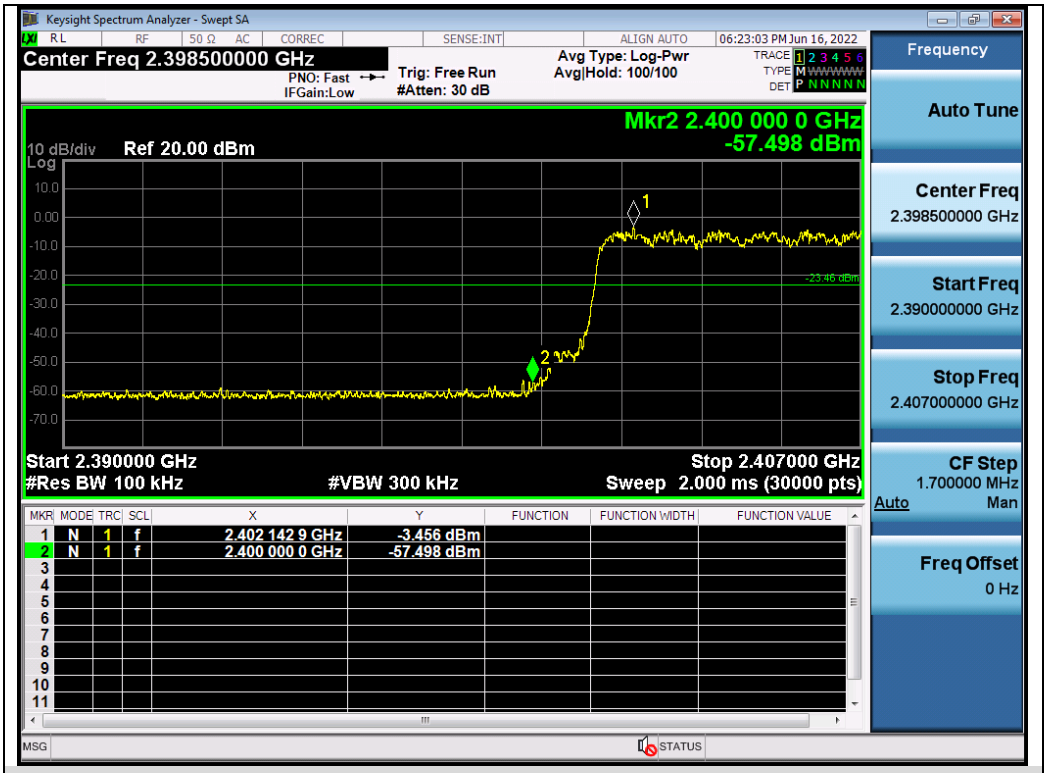
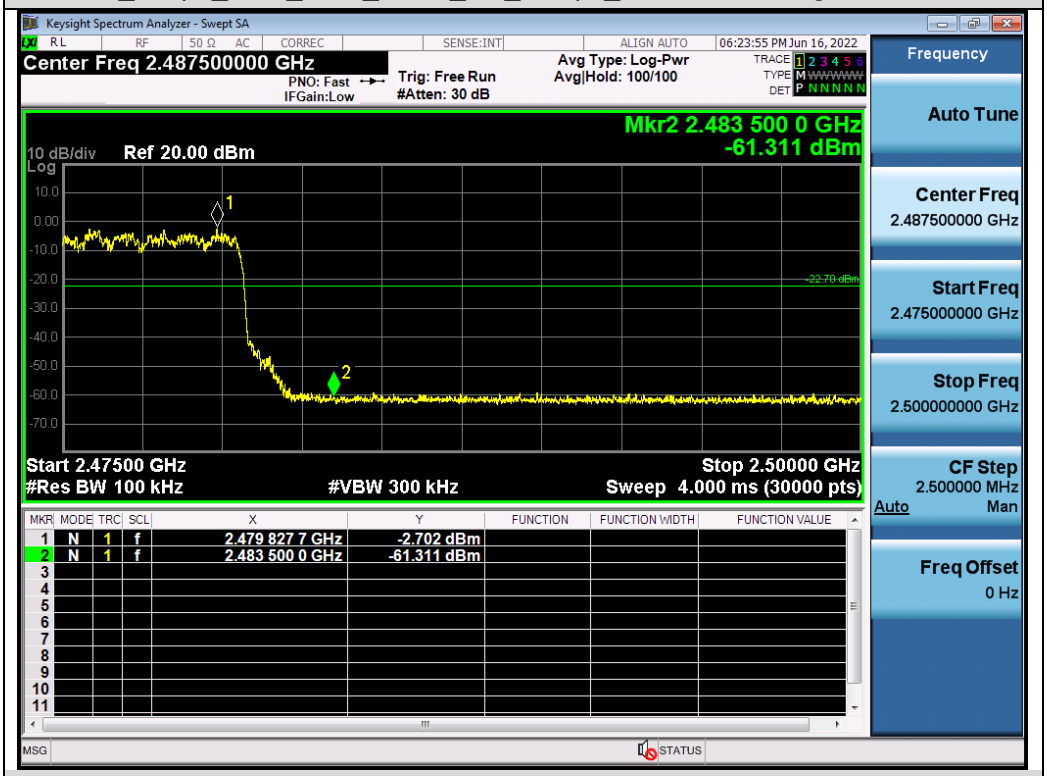



Test_Graph_EDR_HOP_ANT1_NA_3Mbps_Lower Band Edge Emissions




Test_Graph_EDR_HOP_ANT1_NA_3Mbps_Higher Band Edge Emissions

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# 10. RADIATED EMISSION

## 10.1. MEASUREMENT PROCEDURE

1. The EUT was placed on the top of the turntable 0.8 or 1.5 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting units. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
3. The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emissions field strength of both horizontal and vertical polarization.
4. For each suspected emission, the antenna tower was scan (from 1 M to 4 M) and then the turntable was rotated (from 0 degree to 360 degrees) to find the maximum reading.
5. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function with specified bandwidth under Maximum Hold Mode.
6. For emissions above 1GHz, use 1MHz RBW and 3MHz VBW for peak reading. Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.
7. When the radiated emissions limits are expressed in terms of the average value of the emissions, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum values.
8. If the emissions level of the EUT in peak mode was 3 dB lower than the average limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions which do not have 3 dB margin will be repeated one by one using the quasi-peak method for below 1GHz.
9. For testing above 1GHz, the emissions level of the EUT in peak mode was lower than average limit (that means the emissions level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.
10. In case the emission is lower than 30MHz, loop antenna has to be used for measurement and the recorded data should be QP measured by receiver. High - Low scan is not required in this case.

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The following table is the setting of spectrum analyzer and receiver.

| Spectrum Parameter | Setting |
|---|---|
| Start ~Stop Frequency | 9KHz~150KHz/RB 200Hz for QP |
| Start ~Stop Frequency | 150KHz~30MHz/RB 9KHz for QP |
| Start ~Stop Frequency | 30MHz~1000MHz/RB 120KHz for QP |
| Start ~Stop Frequency | 1GHz~26.5GHz<br>1MHz/3MHz for Peak, 1MHz/3MHz for Average |

| Receiver Parameter | Setting |
|---|---|
| Start ~Stop Frequency | 9KHz~150KHz/RB 200Hz for QP |
| Start ~Stop Frequency | 150KHz~30MHz/RB 9KHz for QP |
| Start ~Stop Frequency | 30MHz~1000MHz/RB 120KHz for QP |

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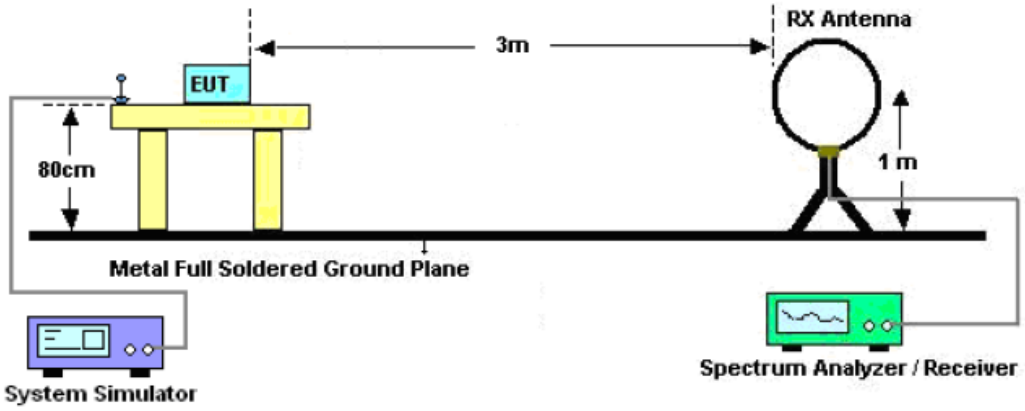
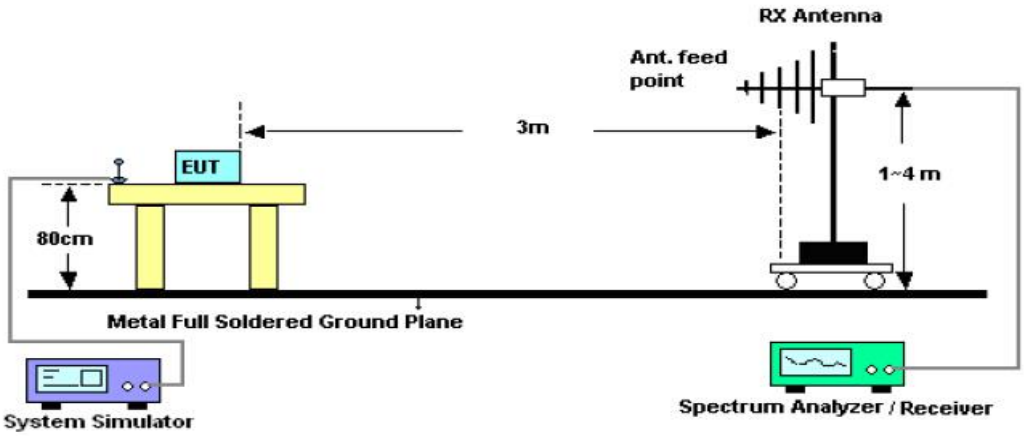
## 10.2. TEST SETUP

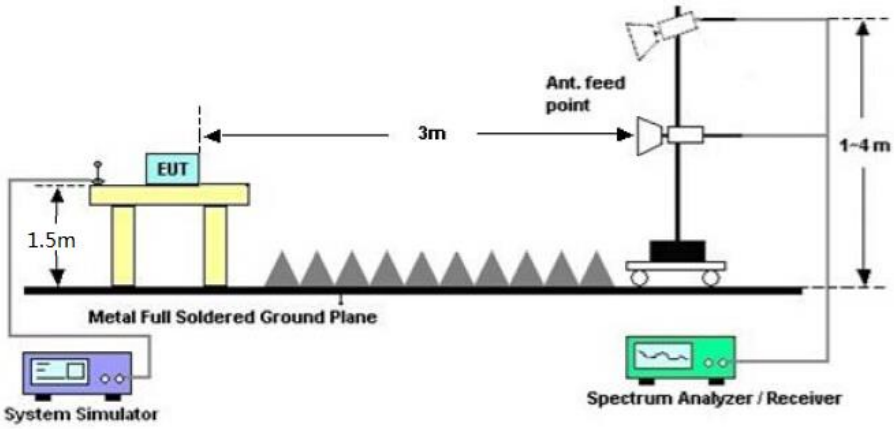
Radiated Emission Test-Setup Frequency Below 30MHz




RADIATED EMISSION TEST SETUP 30MHz-1000MHz




RADIATED EMISSION TEST SETUP ABOVE 1000MHz

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## 10.3. LIMITS AND MEASUREMENT RESULT

15.209 Limit in the below table has to be followed

| Frequencies (MHz) | Field Strength (microvolts/meter) | Measurement Distance (meters) |
|---|---|---|
| 0.009~0.490 | 2400/F(kHz) | 300 |
| 0.490~1.705 | 24000/F(kHz) | 30 |
| 1.705~30.0 | 30 | 30 |
| 30~88 | 100 | 3 |
| 88~216 | 150 | 3 |
| 216~960 | 200 | 3 |
| Above 960 | 500 | 3 |

Note: All modes were tested for restricted band radiated emission, the test records reported below are the worst result compared to other modes.

## 10.4. TEST RESULT

**Radiated emission below 30MHz**

The amplitude of spurious emissions from 9kHz to 30MHz which are attenuated more than 20 dB below the permissible value need not be reported.

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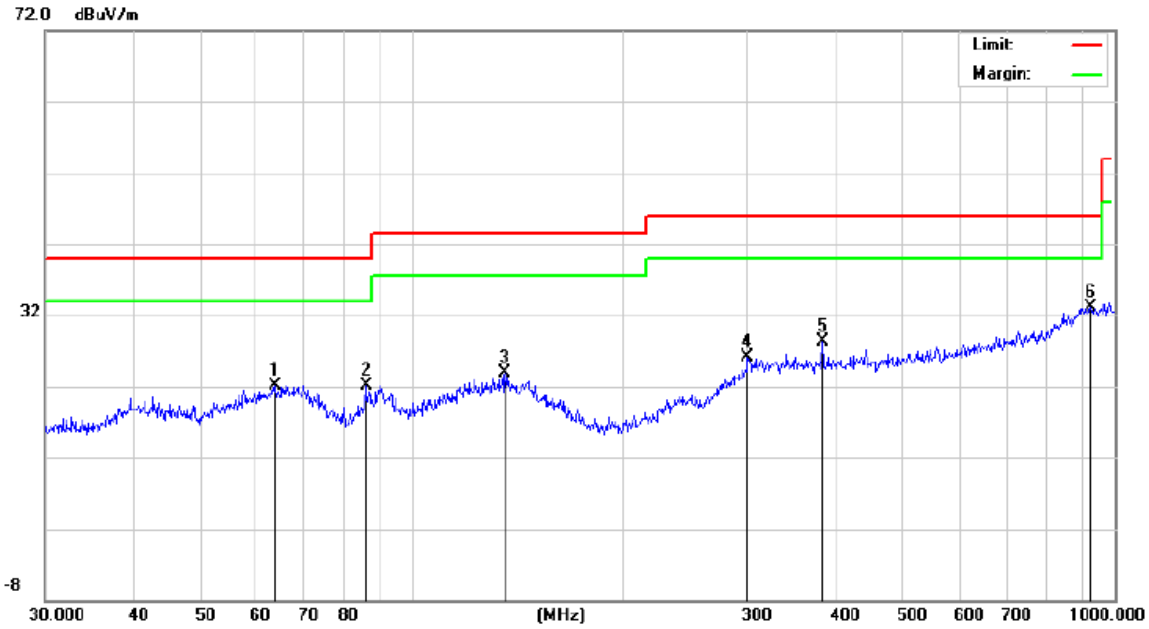
**Radiated emission from 30MHz to 1000MHz**

| | | | |
|---|---|---|---|
| **EUT** | Bluetooth Earphone | **Model Name** | TINBUDS3 |
| **Temperature** | 25°C | **Relative Humidity** | 55.4% |
| **Pressure** | 960hPa | **Test Voltage** | Normal Voltage |
| **Test Mode** | Mode 3 | **Antenna** | Horizontal |




| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | |
|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | Detector |
| 1 | | 63.7588 | 5.38 | 16.72 | 22.10 | 40.00 | -17.90 | peak |
| 2 | | 85.8984 | 7.99 | 14.14 | 22.13 | 40.00 | -17.87 | peak |
| 3 | | 135.5062 | 6.20 | 17.71 | 23.91 | 43.50 | -19.59 | peak |
| 4 | | 300.3672 | 5.62 | 20.44 | 26.06 | 46.00 | -19.94 | peak |
| 5 | | 383.9318 | 7.70 | 20.64 | 28.34 | 46.00 | -17.66 | peak |
| 6 | * | 925.7563 | 5.22 | 27.89 | 33.11 | 46.00 | -12.89 | peak |

**RESULT: PASS**

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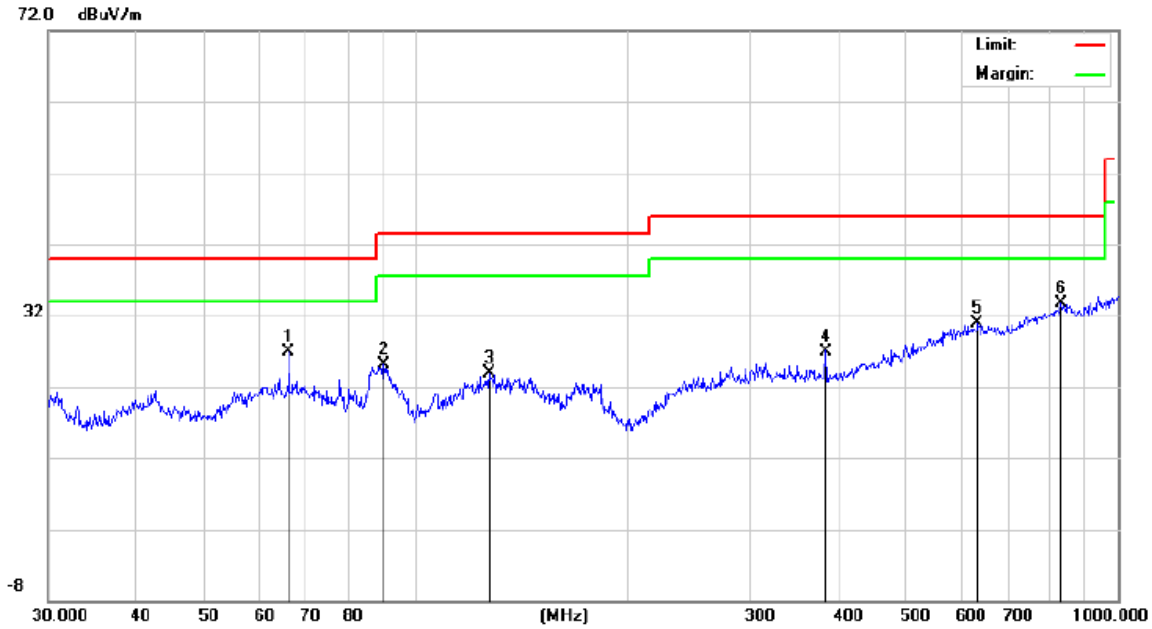
| EUT | Bluetooth Earphone | Model Name | TINBUDS3 |
|---|---|---|---|
| Temperature | 25°C | Relative Humidity | 55.4% |
| Pressure | 960hPa | Test Voltage | Normal Voltage |
| Test Mode | Mode 3 | Antenna | Vertical |




| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | |
|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | Detector |
| 1 | | 66.0342 | 9.86 | 17.01 | 26.87 | 40.00 | -13.13 | peak |
| 2 | | 90.2205 | 10.23 | 14.94 | 25.17 | 43.50 | -18.33 | peak |
| 3 | | 127.2176 | 5.75 | 18.06 | 23.81 | 43.50 | -19.69 | peak |
| 4 | | 383.9318 | 7.94 | 19.06 | 27.00 | 46.00 | -19.00 | peak |
| 5 | | 631.6884 | 5.88 | 25.01 | 30.89 | 46.00 | -15.11 | peak |
| 6 | * | 830.4002 | 6.27 | 27.48 | 33.75 | 46.00 | -12.25 | peak |

**RESULT: PASS**

**Note:** 1. Factor=Antenna Factor + Cable loss, Over=Measurement-Limit.

2. All test modes had been pre-tested. The mode 3 is the worst case and recorded in the report.

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**Radiated emission above 1GHz**

| | | | |
|---|---|---|---|
| **EUT** | Bluetooth Earphone | **Model Name** | TINBUDS3 |
| **Temperature** | 25°C | **Relative Humidity** | 55.4% |
| **Pressure** | 960hPa | **Test Voltage** | Normal Voltage |
| **Test Mode** | Mode 1 | **Antenna** | Horizontal |

| Frequency (MHz) | Meter Reading (dBμV) | Factor (dB) | Emission Level (dBμV/m) | Limits (dBμV/m) | Margin (dB) | Value Type |
|---|---|---|---|---|---|---|
| 4804.000 | 44.36 | 0.08 | 44.44 | 74 | -29.56 | peak |
| 4804.000 | 37.41 | 0.08 | 37.49 | 54 | -16.51 | AVG |
| 7206.000 | 40.52 | 2.21 | 42.73 | 74 | -31.27 | peak |
| 7206.000 | 32.47 | 2.21 | 34.68 | 54 | -19.32 | AVG |
| | | | | | | |
| | | | | | | |
| Remark: | | | | | | |
| Factor = Antenna Factor + Cable Loss – Pre-amplifier. | | | | | | |

| | | | |
|---|---|---|---|
| **EUT** | Bluetooth Earphone | **Model Name** | TINBUDS3 |
| **Temperature** | 25°C | **Relative Humidity** | 55.4% |
| **Pressure** | 960hPa | **Test Voltage** | Normal Voltage |
| **Test Mode** | Mode 1 | **Antenna** | Vertical |

| Frequency (MHz) | Meter Reading (dBμV) | Factor (dB) | Emission Level (dBμV/m) | Limits (dBμV/m) | Margin (dB) | Value Type |
|---|---|---|---|---|---|---|
| 4804.000 | 43.47 | 0.08 | 43.55 | 74 | -30.45 | peak |
| 4804.000 | 36.56 | 0.08 | 36.64 | 54 | -17.36 | AVG |
| 7206.000 | 40.29 | 2.21 | 42.5 | 74 | -31.5 | peak |
| 7206.000 | 31.45 | 2.21 | 33.66 | 54 | -20.34 | AVG |
| | | | | | | |
| | | | | | | |
| Remark: | | | | | | |
| Factor = Antenna Factor + Cable Loss – Pre-amplifier. | | | | | | |

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| | | | |
|---|---|---|---|
| **EUT** | Bluetooth Earphone | **Model Name** | TINBUDS3 |
| **Temperature** | 25°C | **Relative Humidity** | 55.4% |
| **Pressure** | 960hPa | **Test Voltage** | Normal Voltage |
| **Test Mode** | Mode 2 | **Antenna** | Horizontal |

| Frequency (MHz) | Meter Reading (dBμV) | Factor (dB) | Emission Level (dBμV/m) | Limits (dBμV/m) | Margin (dB) | Value Type |
|---|---|---|---|---|---|---|
| 4882.000 | 45.58 | 0.14 | 45.72 | 74 | -28.28 | peak |
| 4882.000 | 38.41 | 0.14 | 38.55 | 54 | -15.45 | AVG |
| 7323.000 | 41.52 | 2.36 | 43.88 | 74 | -30.12 | peak |
| 7323.000 | 34.33 | 2.36 | 36.69 | 54 | -17.31 | AVG |
| | | | | | | |
| | | | | | | |
| Remark: | | | | | | |
| Factor = Antenna Factor + Cable Loss – Pre-amplifier. | | | | | | |

| | | | |
|---|---|---|---|
| **EUT** | Bluetooth Earphone | **Model Name** | TINBUDS3 |
| **Temperature** | 25°C | **Relative Humidity** | 55.4% |
| **Pressure** | 960hPa | **Test Voltage** | Normal Voltage |
| **Test Mode** | Mode 2 | **Antenna** | Vertical |

| Frequency (MHz) | Meter Reading (dBμV) | Factor (dB) | Emission Level (dBμV/m) | Limits (dBμV/m) | Margin (dB) | Value Type |
|---|---|---|---|---|---|---|
| 4882.000 | 45.63 | 0.14 | 45.77 | 74 | -28.23 | peak |
| 4882.000 | 37.51 | 0.14 | 37.65 | 54 | -16.35 | AVG |
| 7323.000 | 40.48 | 2.36 | 42.84 | 74 | -31.16 | peak |
| 7323.000 | 33.42 | 2.36 | 35.78 | 54 | -18.22 | AVG |
| | | | | | | |
| | | | | | | |
| Remark: | | | | | | |
| Factor = Antenna Factor + Cable Loss – Pre-amplifier. | | | | | | |

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| | | | |
|---|---|---|---|
| **EUT** | Bluetooth Earphone | **Model Name** | TINBUDS3 |
| **Temperature** | 25°C | **Relative Humidity** | 55.4% |
| **Pressure** | 960hPa | **Test Voltage** | Normal Voltage |
| **Test Mode** | Mode 3 | **Antenna** | Horizontal |

| Frequency (MHz) | Meter Reading (dBμV) | Factor (dB) | Emission Level (dBμV/m) | Limits (dBμV/m) | Margin (dB) | Value Type |
|---|---|---|---|---|---|---|
| 4960.000 | 46.74 | 0.22 | 46.96 | 74 | -27.04 | peak |
| 4960.000 | 38.56 | 0.22 | 38.78 | 54 | -15.22 | AVG |
| 7440.000 | 41.41 | 2.64 | 44.05 | 74 | -29.95 | peak |
| 7440.000 | 32.42 | 2.64 | 35.06 | 54 | -18.94 | AVG |
| | | | | | | |
| | | | | | | |
| Remark: | | | | | | |
| Factor = Antenna Factor + Cable Loss – Pre-amplifier. | | | | | | |

| | | | |
|---|---|---|---|
| **EUT** | Bluetooth Earphone | **Model Name** | TINBUDS3 |
| **Temperature** | 25°C | **Relative Humidity** | 55.4% |
| **Pressure** | 960hPa | **Test Voltage** | Normal Voltage |
| **Test Mode** | Mode 3 | **Antenna** | Vertical |

| Frequency (MHz) | Meter Reading (dBμV) | Factor (dB) | Emission Level (dBμV/m) | Limits (dBμV/m) | Margin (dB) | Value Type |
|---|---|---|---|---|---|---|
| 4960.000 | 46.63 | 0.22 | 46.85 | 74 | -27.15 | peak |
| 4960.000 | 38.58 | 0.22 | 38.8 | 54 | -15.2 | AVG |
| 7440.000 | 40.62 | 2.64 | 43.26 | 74 | -30.74 | peak |
| 7440.000 | 31.51 | 2.64 | 34.15 | 54 | -19.85 | AVG |
| | | | | | | |
| | | | | | | |
| Remark: | | | | | | |
| Factor = Antenna Factor + Cable Loss – Pre-amplifier. | | | | | | |

**RESULT: PASS**

**Note:**

The amplitude of other spurious emissions from 1G to 25 GHz which are attenuated more than 20 dB below the permissible value need not be reported.

Factor = Antenna Factor + Cable loss - Amplifier gain, Margin=Level-Limit.

The “Factor” value can be calculated automatically by software of measurement system.

All test modes had been tested. The GFSK modulation is the worst case and recorded in the report.

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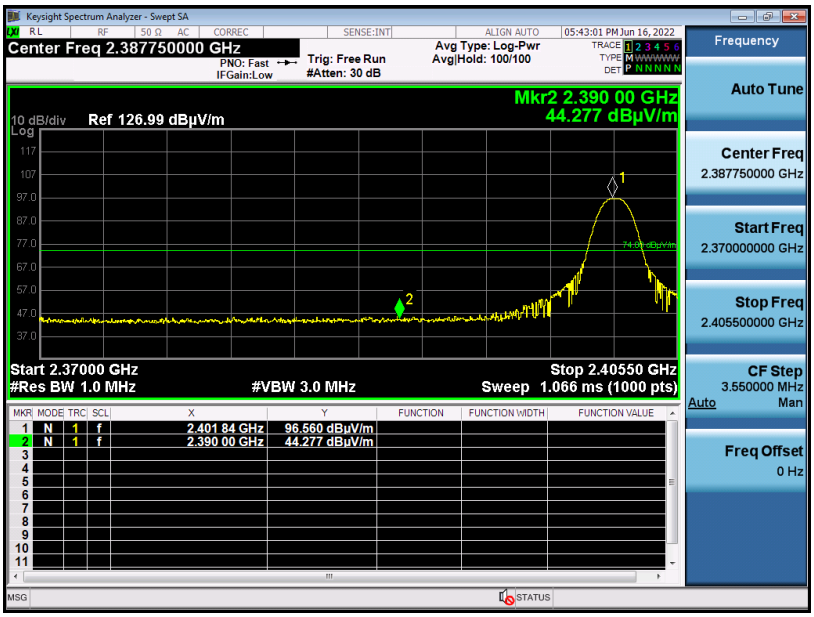
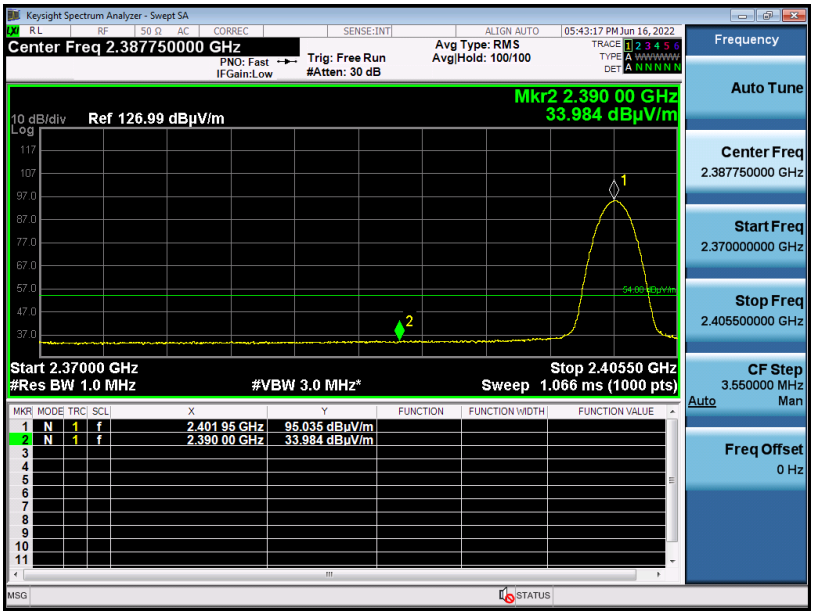
## Test result for band edge emission at restricted bands

| | | | |
|---|---|---|---|
| **EUT** | Bluetooth Earphone | **Model Name** | TINBUDS3 |
| **Temperature** | 25°C | **Relative Humidity** | 55.4% |
| **Pressure** | 960hPa | **Test Voltage** | Normal Voltage |
| **Test Mode** | Mode 1 | **Antenna** | Horizontal |

Test Graph for Peak Measurement




Test Graph for Average Measurement




**RESULT: PASS**

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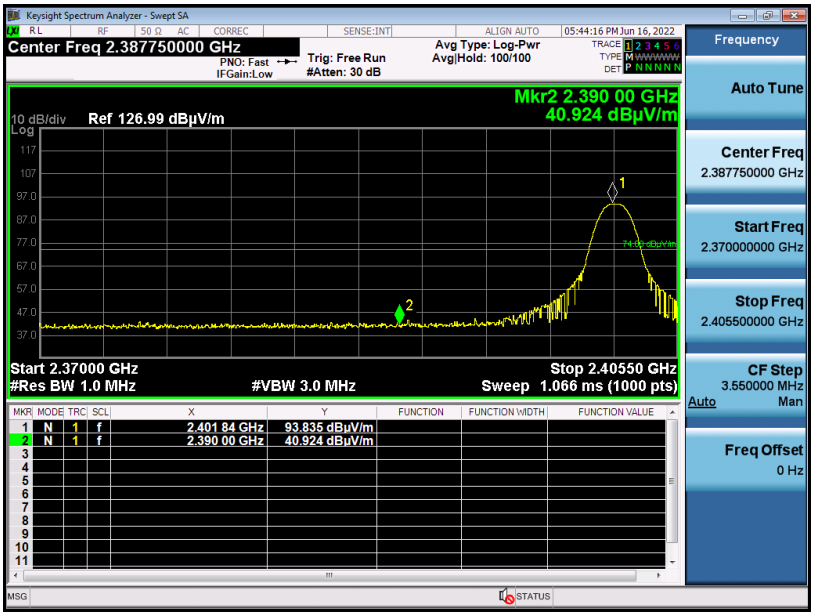
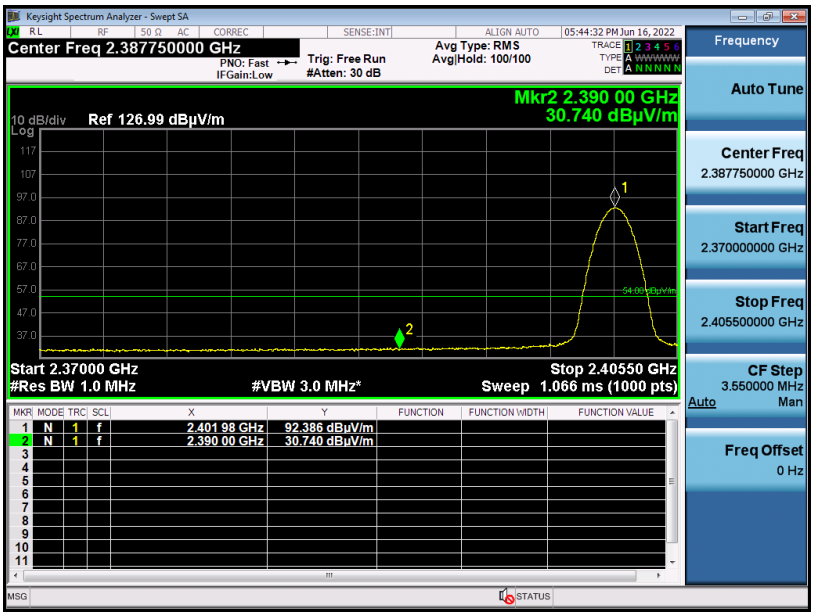
| | | | |
|---|---|---|---|
| **EUT** | Bluetooth Earphone | **Model Name** | TINBUDS3 |
| **Temperature** | 25°C | **Relative Humidity** | 55.4% |
| **Pressure** | 960hPa | **Test Voltage** | Normal Voltage |
| **Test Mode** | Mode 1 | **Antenna** | Vertical |

Test Graph for Peak Measurement




Test Graph for Average Measurement




**RESULT: PASS**

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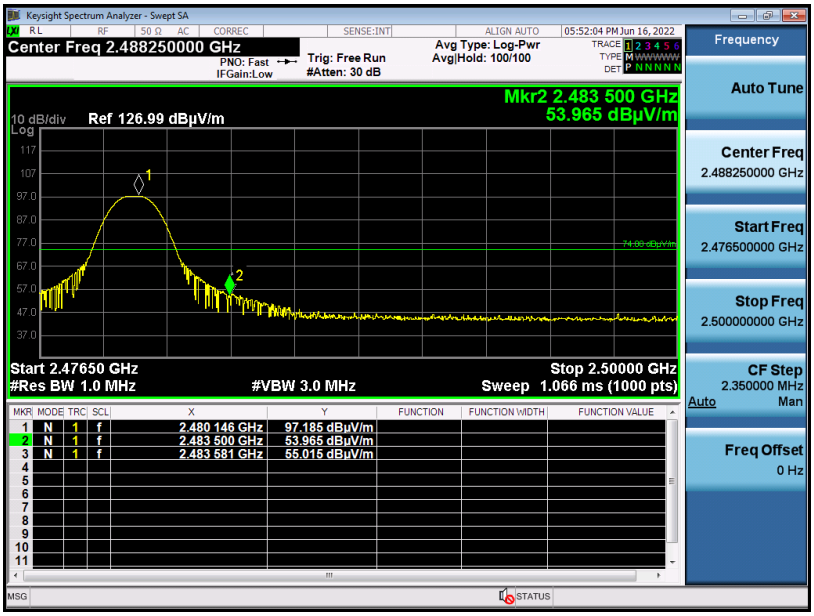
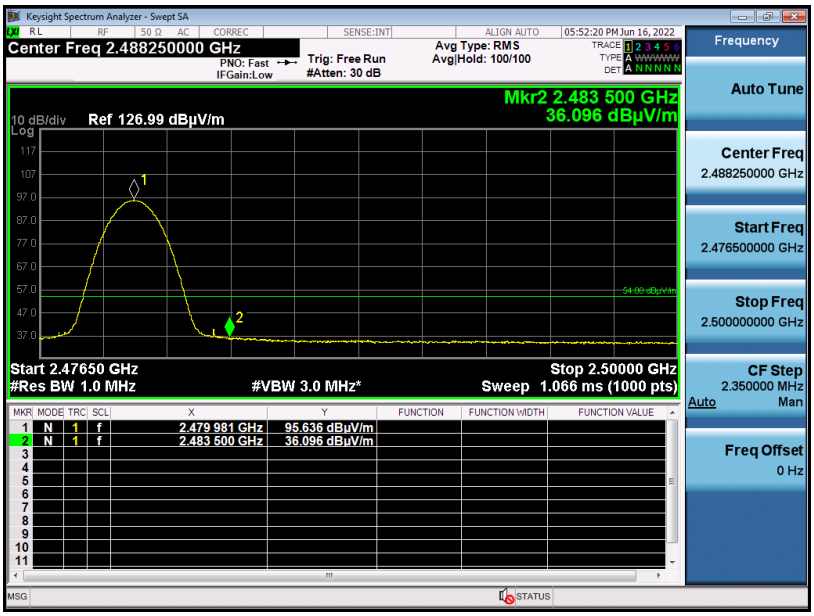
| EUT | Bluetooth Earphone | Model Name | TINBUDS3 |
|---|---|---|---|
| Temperature | 25°C | Relative Humidity | 55.4% |
| Pressure | 960hPa | Test Voltage | Normal Voltage |
| Test Mode | Mode 3 | Antenna | Horizontal |

Test Graph for Peak Measurement




Test Graph for Average Measurement




**RESULT: PASS**

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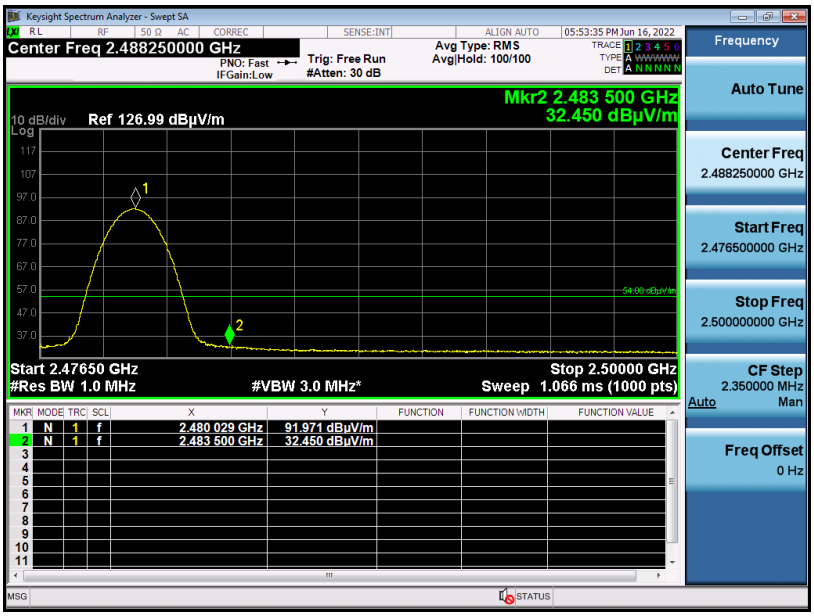
| | | | |
|---|---|---|---|
| **EUT** | Bluetooth Earphone | **Model Name** | TINBUDS3 |
| **Temperature** | 25°C | **Relative Humidity** | 55.4% |
| **Pressure** | 960hPa | **Test Voltage** | Normal Voltage |
| **Test Mode** | Mode 3 | **Antenna** | Vertical |

Test Graph for Peak Measurement

Test Graph for Average Measurement




**RESULT: PASS**

Note: The factor had been edited in the “Input Correction” of the Spectrum Analyzer. The GFSK modulation is the worst case and recorded in the report.

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# 11. NUMBER OF HOPPING FREQUENCY

## 11.1. MEASUREMENT PROCEDURE

The EUT shall have its hopping function enabled. Use the following spectrum analyzer settings:

1. Span: The frequency band of operation. Depending on the number of channels the device supports, it may be necessary to divide the frequency range of operation across multiple spans, to allow the individual channels to be clearly seen.
2. RBW: To identify clearly the individual channels, set the RBW to less than 30% of the channel spacing or the 20 dB bandwidth, whichever is smaller.
3. VBW ⩾ RBW. Sweep: Auto. Detector function: Peak. Trace: Max hold.
4. Allow the trace to stabilize.

## 11.2. TEST SETUP (BLOCK DIAGRAM OF CONFIGURATION)

Same as described in section 8.2

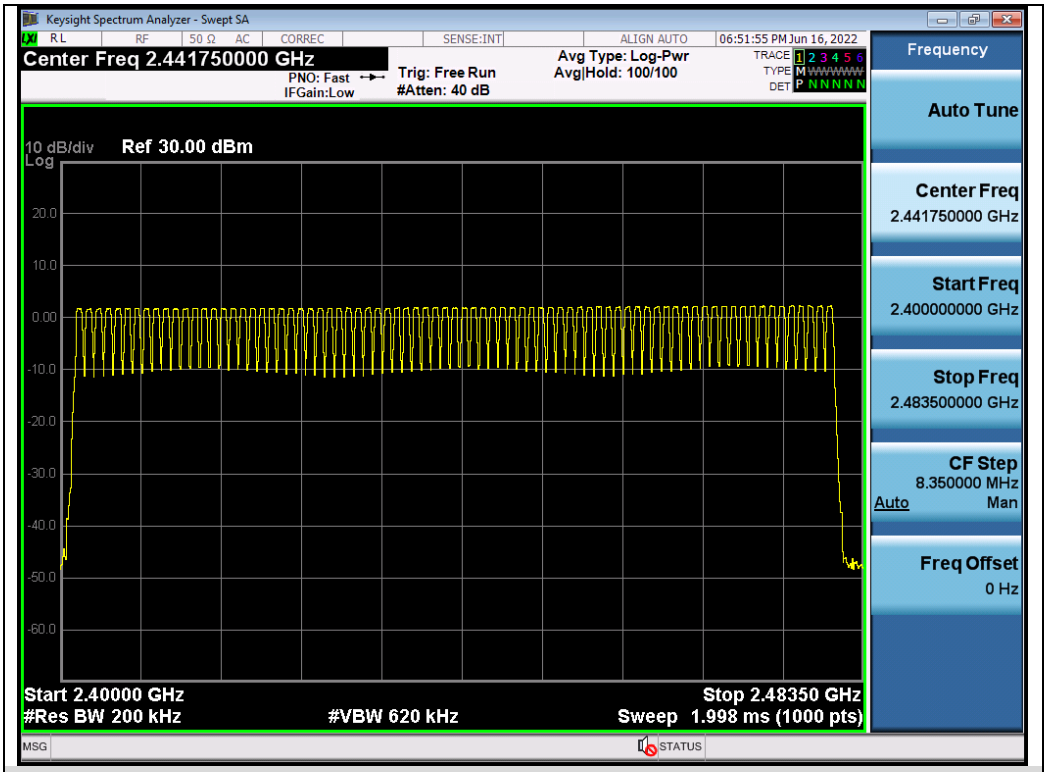
## 11.3. MEASUREMENT EQUIPMENT USED

The same as described in section 6

## 11.4. LIMITS AND MEASUREMENT RESULT

| Test Data of Number of Hopping Frequency | | | |
|---|---|---|---|
| Test Mode | Number of Hopping Frequency | Limits | Pass or Fail |
| GFSK Hopping | 79 | >=15 | Pass |

**Test Graphs of Number of Hopping Frequency**




Test_Graph_BR_HOP_ANT1_NA_1Mbps_Number of Hopping

Note: The GFSK modulation is the worst case and recorded in the report.

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